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Armstrong's Railroad Frog.

THE "wear and tear of the permanent way of a railroad" is an expression that may be termed paradoxical. The track or permanent way has too much hard work to perform to be anything near "permanent," and all that can be done is to adopt the best and most durable form of metal and other material for the multifarious appliances which make up the plant of a Railroad Company.

The illustrations which accompany this article are those of frogs and crossings manufactured by Messrs. ARMSTRONG & Co., Brinsworth Steel Works, Rotherham, England, and which have been patented in this country as well as in Great Britain.

Their excellence consists in the grade or description of metal of which they are manufactured, rather than in any material divergence from the ordinary form of frog now in use.

The objectionable use of cast-steel has been avoided, and hammered or forged steel substituted as being vastly more reliable, durable, and consequently econimical.

"ARMSTRONG'S PATENT FORGED CRUCIBLE STEEL FROG," the superiority of which consists in its being a *forging* instead of a *casting* of steel. The frog is reversible, is manufactured entirely of crucible steel, and is hammered into shape directly from the ingot without a wield. It is, of necessity, made from steel of a superior grade, to allow of its being hammered, and the density and toughness given to the metal by this process render the frog vastly more durable than any other, and almost indestructible.

Unlike the ordinary cast-steel frog, it is ensured perfectly sound and free from blow-holes ; it cannot crush or chip ; neither will it break under any weight or concussion to which it may be subjected. Being a forging, it retains sufficient elasticity to prevent any rigidity felt in running over all cast frogs. The metal of the frog can be re-forged or rolled. It has a permanent worth as old metrl, and can be sold for a large proportion of the first cost. It is so designed that the *fish bar fastening can be applied at both ends of the crossing*, thereby giving it a security and firmness not obtainable in any other frog. The advantage obtained by fishing is, that it makes a continuous rord, and a *suspended* joint avoids the sudden blow which occurs when running over a *supported* one.

After nearly four years of constant and hard wear on many of the heaviest-worked English railroads, there is scarcely any percepible wear ; the points and other susceptible parts are nearly as good as they were the day they were put down, and cast-steel frogs that were placed alongside them, and subjected to the same traffic, have had both sides worn out, and replaced with new frogs.

Reversible Rolled Steel Frog.

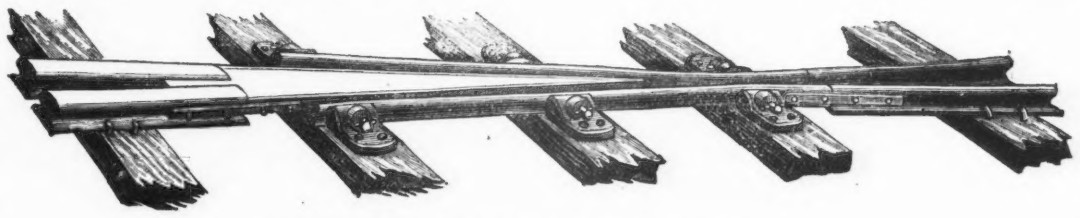
The section of this frog is shown near to its point. The cotter pins do not run through the frog, but are simply screwed into both sides, the better to hold the brackets in their proper position.

The second frog illustrated is a modification of the forged steel frog, and was invented to secure a thoroughly reliable and more economical continuous rail frog than can be manfactured by simply bolting together two rails to form the tongue or V of the frog.

The section shews the manner of construction of the crossing. The whole of the V part of the frog is a solid reversible forging of crucible steel, made without a weld. The two wings are formed of Bessemer steel rails of the same section as the track rails, and rest on the tie or sleeper, secured with spikes or screws in the usual way. About three-fourths of an inch of the tie is cut away, to allow the under side of the tongue to take its proper bearing, or, to avoid this, plates of iron of the required thickness may be riveted on to the wing rails, so that the bottom of the V and the wing rails may be in a right line.

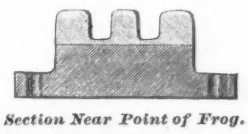
The general plan of this crossing is similar to the others illustrated. The advantages of a rolled steel frog, when compared with a cast one, are greater toughness and even structure ; and being made with one wing rail separated from the tongue and connected with the other rail, the rigidity of the solid frog is avoided, and a flexibility given to the whole frog not possessed by that where both the wings are separated from the tongue.

Where first cost is a consideration, and the ordinary cast iron frog with a plate of steel riveted on to its face, is to be superseded by better material, Messrs. ARMSTRONG have constructed a malleable iron crossing having a thin face of crucible steel cast on to its face.



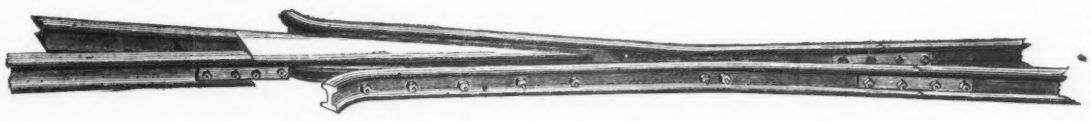
FORGED CRUCIBLE STEEL REVERSIBLE FROG.

This frog is represented in the accompanying cut, and a section shewing the manner of joining the two metals is also given.



Section Near Point of Frog.

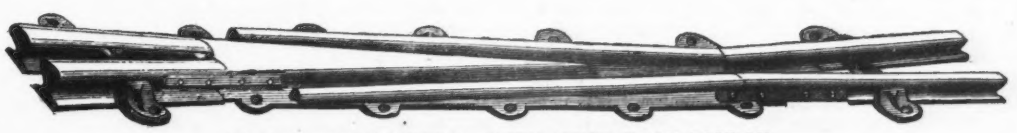
The process employed in fastening cast steel to cast iron may be reverted to at some future time ; it is sufficient here to note merely that this has been successfully done, and its applicability to the manufacture of a railroad frog is one of the many uses in which this invention shews its worth and economy. The frog, after it has been cast, is made malleable by annealing, a process which very largely adds to its strength by reason of increased ductility given to the iron part of the frog, and a toughness of the steel face, thereby preventing all liability to chipping and flaking, when subjected to the heavy blows of great weights and the severe concussions consequent upon heavy trains running over the frog at high speed.



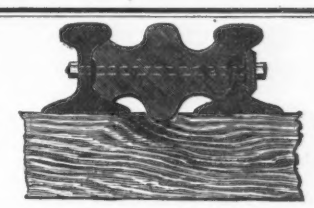
SOLID FORGED CRUCIBLLE STEEL FROG, WITH RERSIBLE V.

Section near Point of Frog.

The ordinary iron frog, plated with sheet steel, will always, from the very nature of the case, laminate and run over at the sides, when subjected even to but little wear ; and, under but moderate traffic, it has been found necessary, certainly as often as once in twelve months, to take the frog out of the track for replating. This constant interference with the roadway is both expensive and inconvenient, and the use of the malleable frog will not only give an increased durabilility at least ; that of the plated frog, but its power to resist heavy compressive strains is more than one hundred per cent. greater than if the body of the crossing were made only of crude cast iron. By rendering cast iron malleable, a toughness is imparted to it that gives it all the fibrous quality of wrought iron ; and it is increased strength added to the introduction of crucible cast steel for the working face of the frog that gives it the superiority it has been proved to possess, by comparison with the ordinary cast cast-steel, or sheet-steel plated frogs.



MALLEABLE IRON FROG, WITH STEEL FACE CAST ON.



Section near Point of Frog.

MESSRS. ARMSTRONG'S agent in this country is Mr. W. C. OASTLER, 43 Exchange Place, to whom communications on the subject of these goods may be addressed.

Liverpool to Bombay, via the Suez Canal.

AT present the public and also commercial men are anxious to know the real value of the Suez Canal, either in a financial point of view or in the saving of time in the transmission of goods between England and Bombay. The following figures, from the *Liverpool Albion*, which have been compiled by one of the officials connected with the Liverpool Chamber of Commerce, will be read with considerable interest. From this statement it appears that at the opening of the canal last year the rate of freights from Liverpool to Bombay, *via* the canal, was 80s. per ton, but at the present time rates per the same route do not exceed 30s. per ton, overland rates being about the same. No sailing vessels, it appears, convey goods either *via* the Suez Canal or overland route, and the following quotations are consequently for steamers alone :—Sailing vessels. Average duration of voyage to India—*via* Cape of Good Hope, 95 days ; *via* overland route, 43 days ; *via* Suez Canal, 38 days ; to the United States, 40 days. Steam Vessels.—Average duration of Voyage to India—*via* Cape of Good Hope, 60 days ; *via* overland route, 43 days ; *via* Suez Canal, 38 days ; to the United States, 12 days. Sailing Vessels.—Average rate of freight per ton to India —*via* Cape of Good Hope, 35s. ; *via* Suez Canal, 40s. ; to the U. S. 10s. Steam Vessels. —Average rate of freight per ton to India—*via* Cape of Good Hope, 60s. : *via* overland route, 80s. ; *via* Suez Canal, 40s. ; to the U.S. 30s.

In addition to this, it is stated that the directors of the Peninsular and Oriental Company intend to start a line of traffic steamers between England India, *via* the Suez Canal, and that a branch head-quarters office is to be established at Liverpool. The homeward-bound French steamer from Bombay for Marseilles, *via* the Canal, had many passengers on board. The *Malta Times* of January 19 reports that the partizans of the French lines confidently affirm that they will soon take both passengers and goods traffic out of the hands of the Peninsular and Oriental Company ; but the *Malta Times* is of opinion that with an energetic superintendent at Liverpool the Peninsular and Oriental would soon have the great majority of the export and import trade with the East in its own hands.

Alloys of Manganese.

ACCORDING to an exchange, Mr. A. VALENCIENNES, of the chemical works at St. Denis, near Paris, has lately prepared metallic manganese and several of its alloys. The former, obtained by the reduction of pure binoxide of manganese in a magnesia crucible, formed a brittle and very hard button. Immediately after breaking it, the pieces were as white as cast iron, but more rapidly oxidized by the air. Manganese shows great affinity for copper. VALENCIENNES prepared alloys of copper and manganese, containing from three to twenty percent. of manganese, all of which resemble very much the copper-tin alloys, (bronzes) being, like these, hard, sonorous and easily fusible. The alloy containing fifteen per cent. of manganese, is gray, very hard, brittle, fuses like bronze, is easily cast into moulds, and remains unchanged for some time. Thealloy with twelve per cent. of manganese is also brittle and very hard, gray after being turned, but soon becomes yellow as brass.

Tin Ores in the United States.

PROFESSOR J. P. LESLEY, the distinguished geologist, now editor of the *United States Railroad and Mining Journal* of Philadelphia, publishes the following letter from Dr. GENTH, of that city, on the above subject. Dr. GENTH is eminent as a chemist, and trustworthy as a man. It will be seen that his evidence corroborates the position held from the beginning by this Journal, with regard to the tin excitement in Missouri.

PROF. J. P. LESLEY—Dear Sir: It is surprising that, whilst we produce an abundance of gold, silver, copper, iron, zinc, nickel, chrome, etc., in fact of almost every commercially important metal, and that, for their supply we are, or at least should be, entirely independent of other nations, *tin* has been met with only in exceedingly small quantities. Although this metal occurs at numerous places in this country, there exists at present not a single mine which ships any ore or sends any metal to market, and from our present knowledge, the indications are not favorable that any of the localities, with the exception perhaps of one or two, will be able to supply this want, and eventually produce larger quantities. We send every year millions of dollars to England and the East Indies, and the discovery of a valuable tin mine is therefore a great desideratum, and would be of much importance.

The principal, and, in fact the only ore, from which the great bulk of tin is extracted, is the natural binoxide of tin or cassiterite. This mineral, if not in well-defined crystals, generally would attract but little attention, and frequently resembles various silicates, such as garnet, tourmaline, etc., so much, that only persons familiar with mineralogy, would be able to distinguish between them. During the last twenty years, I have received for examination, from all parts of this country, numerous specimens of rocks and minerals, which were suspected to contain tin. Some of the results which I have obtained were of considerable interest, and I take the liberty to communicate them, together with all the data which I have been able to find having reference to the occurrence of this metal.

In Maine, cassiterite occurs sparingly in small crystals at Paris, Hebron, and Greenwood. A short time ago it was discovered at Winslow, near Waterville College, where it is said to exist in greater abundance. Some specimens, which I received, somewhat resemble the ore from some of the European localities. My pieces consist of a silicious grey slate with small scales of mica and minute crystals of arsenopyrite (mispickel), violet and white fluorite, upon this is a stratum of mica similar in appearance to the variety of lithia-mica, called "zinnwaldite"—but of a different composition, upon it fluorite again, with very little pyrrhotine and isolated crystals of brownish-black cassiterite. Judging from my specimens, the ore appears to occur in very thin seams, and it is doubtful whether it would pay for working.

In New Hampshire, cassiterite has been found at Lyme, and somewhat more abundant, but not in workable quantities, at Jackson.

In Massachusetts, the microlite of Chesterfield contains 0.7 per cent. of stannic acid, and a few crystals of cassiterite have been found at Chesterfield, Beverly, Norwich and Goshen.

The columbites from Haddam and Middletown, Connecticut, contain from a mere trace to 0.6 per cent. of stannic acid; traces of it I have also found in the slightly auriferous pyrite of Tolland.

About eighteen years ago, I made numerous analyses of a variety of a greyish clay from Pennsylvania, all of of which showed small quantities of tin, varying from traces to about one per centum. The party who gave me the samples for examination was very sanguine to find a valuable tin mine in this State, but he died before he could accomplish his object. I never was able to learn the exact locality where this clay came from.

Cassiterite is said to occur sparingly in talco-micaceous slates in some of the Virginia gold mines; I have not been able to find any, although I washed the sand from numerous localities. As a very doubtful occurrence of metallic tin, I will mention that from Campbell county. Professor FRANCIS H. SMITH, of the University of Virginia, sent me a piece in 1855, and to my observation that I considered it as artificial, he replied that he had seen specimens with quartz attached, and that he thought it really a genuine native tin. I have never since heard anything about this occurence.

In North Carolina, I have found traces of tin in the wolfram of the Flowe mine in Mecklenburg county, and 0.13 per cent. in the scheelite from the Dutchman vein of the Bangle gold mine in Cabarrus county.

About two or three years ago, a great tin excitement existed in Missouri and a great deal of money has been lost in buying up worthless lands, which had been represented as containing valuable deposits of tin. The ores which were sent to me for examination at that time were of various kinds. A greenish epidotic rock contained no tin at all; a granite of medium grain, principally consisting of quartz and feldspar, with very little mica, and which was sent as the principal tin ore, contained only a trace of tin, and the black sands from the neighborhood contained a considerable quantity of magnetite, but also only a mere trace of tin. In neither was the tin in sufficient quantity or condition to be at all available. The occurrence of valuable tin ore in Missouri had been endorsed by the United States General Land Office on fraudulent specimens, which had been sent there as Missouri tin ore, and which probably came from Cornwall, England. After some correspondence about it, I received, through the kindness of Dr. A. R. ROESSLER, a very interesting rock from Madison county, Mo., which in reality contained more tin than any which I had previously examined from there. The rock consisted of a mixture of quartz, feldspar, some pyroxene, magnetite and sphene. An nalysis of the whole rock gave:

Silicic acid	=45.95
Titanic acid	1.87
Stannic acid	0.50 = 0.39 tin.
Oxide of iron	15.26
Oxide of manganese	0.18
Alumina	14.32
Magnesia	4.44
Lime	10.36
Alkalies	7.12

The stannic acid being isomorphous with titanic acid probably substituted in the sphene a portion of it, making the percentage of stanniferous sphene in the rock about 5.7 per cent.

For my inability to find, in the minerals and rocks sent to me from Missouri, tin in workable quantities, I have been bitterly abused, and all sorts of absurd assertions have been made about that tin, for instance, that it required very great skill to find it, as it existed in the ore as an alloy of tin with iridium, etc.

In California, tin ore has been found in 1860, and I have analyzed an average sample from the Cajalco mine, San Bernardino county, in 1861, which yielded 22.45 per cent. of tin. The ore consisted of a grey quartz, mixed with a considerable quantity of hydrated oxides of iron and manganese, cassiterite and minute quantities of black tourmaline. Prof. WHITNEY, in his "Geological Survey of California," Vol I, p. 180, states that in 1860–61 a great excitement existed on the subject of tin, and that claims were located on seams and streaks of dark *hornblende*, running irregularly through granite or slightly metamorphic rocks of the Temascal region. It does not appear that any of the old mines, then taken up have been productive. A short time ago I received through the kindness of Dr. A. R. ROESSLER and Rev. Dr. R. E. BEADLE, specimens from a recently discovered mine, the San Jacinto mine, San Bernardino county, together with some metallic tin, smelted from the ore. The appearance of the ore is very peculiar. The quartzose ores resemble those from the Cajalco mine, although they are less mixed with earthy matter. Most of the specimens, however, consist of black tourmaline *(not hornblende)* of a very fine grain or crypto-crystalline needles, with greyish white quartz and, in small seams or patches, disseminated through the matrix, the cassiterite in flesh-colored very fine grains, resembling some varieties of manganesian garnet; other specimens consist of tourmaline with a more coarsely crystalline cassiterite of high lustre and semi-transparent with reddish brown color. In a preliminary examination of an average sample from my specimens, I found 13.7 per cent. of tin. The ore is very easily concentrated by crushing and washing. In a sample thus concentrated (1) and in another sent from California (2) I found:

	1.	2.
Silicic acid	=7.20	9.82
Tungstic acid	1.08	0.22
Stannic acid	82.00=64.52 tin.	76.15=59.92 tin.
Oxide of copper	0.32	0.27
Oxide of iron, manganese, alumina, magnesia, lime, boracic, acid, etc.	9.40	13.54

The tin which was smelted from this ore contained: Tin=99.78; Iron=0.11; Copper=0.11.

I am not informed whether or not the ore exists in sufficient quantities to warrant the exploitation of the mine.

Another specimen of tin ore has been found in the northern part of the State, at Weaverville, but the vein seems not to have been found yet.

The cassiterite from Jordan Creek, near Boonville, Idaho, I have not yet seen, and have no information with reference to its occurrence.

Hoping that some of these data may be of interest to you, I remain yours, truly, F. A. GENTH.

PHILADELPHIA, Nos. 108 AND 112 ARCH STREET, MAY 4, 1870.

The Manufacture of White Lead.

BY PROFESSOR H. E. COLTON.

THE pigment known to commerce and general use as white lead is usually called carbonate of lead. This is not strictly true. It is a carbonate and hydrated oxide of lead, chemically symbolized $2(PbO, CO_2)+PbO, H O$. This article is produced by what is called the Dutch process; it has great "body" and is amorphous in structure. There is sometimes found in the market a white lead not made by this process, which is more strictly a carbonate of lead, is symbolized PbO, CO_2, crystalline in structure, and made by precipitation, or what we shall call the French process.

The Dutch process has been in use for over two hundred years; and, except in improved manipulations and some changes of the machinery, it is substantially the same as that used a century ago. This seems somewhat strange in this day of inventions and improvements; but this result is not from lack of effort, as the long list of patents recorded in America and Europe attests. We may broadly assert, with truth, that none of these have stood the test of time, and all have proved failures.

The Dutch process, as at present conducted, is as follows: The lead to be used must be "soft;" very little American lead is fit for this purpose, being "hard." Hence, with the exception of a small quantity, all the lead consumed by the white lead manufacturers is imported and pays a duty to the United States. Therefore, if they are protected in their article manufactured, they in turn pay a duty on the raw material used. The lead is melted in an iron pot, covered with a muffle and having a spout on one side. On this same side of the pot is a round, table-like frame, which revolves slowly. In this table are moulds, and the machinery is so constructed that as each mould comes under the spout the turning of the table ceases for a moment. Two men attend this machine and pot; one holds a sort of poker in his hand, with which he stops the spout while the table is revolving; the other takes off the castings, brushes out the moulds, and adds more lead to the pot as needed. This casting forms what are called buckles, usually shaped like a ring, with two bars crossing it at right-angles through its centre. No great effort is made to attain smoothness in these castings, as they are better if somewhat rough. These buckles are carted to the bin-sheds, and there placed in small earthen pots, which have a notch nearly one-half down the side. These pots are glazed inside and very much resemble a three-pint flower-pot. The pots are first placed in the bins, and about half a pint or more of dilute acetic acid put in each of them. Then the buckles are dropped in so that the spokes or cross-pieces of each one come alternately over the spaces of the one below, thus allowing circulation. The pots decrease materially in size just below the open notch. This is to prevent the buckles from going entirely to the bottom, and to keep them an inch or two above the acid. When a tier of pots has been laid, each row is covered with boards, and these with spent tan-bark from the tanneries; then an open floor of boards and another row of pots, and so on, until the bin is filled. A bin usually contains from ten thousand to twelve thousand pots, from ten to twelve tons of metallic lead, and about fifty-three gallons of dilute acetic acid. The bin, being fully packed, is closed up, and the process begins. In a few days a bluish-white smoke will commence to rise from the ventilating chimney, and when this entirely ceases the bin is considered perfectly ready to open. But as the upper tier of pots are finished before the lower, it is not usual to wait for the entire ceasing of the smoke, though a care for the health of the men and the production of a more perfect article would dictate such a course. The time from closing a bin (or stack, as it is sometimes called) to the time of opening it to take out the corroded lead, is about six months—sometimes longer. When opened, the contents of the pots are emptied into buckets and conveyed to crushers and sifters, where the crude white lead is separated from such metallic lead as may remain uncorroded. If this operation is not well conducted, small particles of metal will be left in the pigment and injure its color and quality. The tan is carted to the yard, aired and sunned, and aired again. After being used several times, it is best to replace it with fresh bark. The pigment separated from the "blue lead" goes through various washings, and is finally dried in kilns. It is sold dry or ground in oil. Of this department we shall treat farther on.

The theory of this operation is somewhat in dispute; but the most reasonable view seems to be, that the tan and oxygen in the confined bin generate heat; this heat evaporates the acetic acid, which attacks the lead and corrodes it, forming a a variety of acetate; the heat in the meantime increasing, causes the tan to generate and throw off carbonic acid. This gas, having great affinity for the oxide of lead, atttacks it and sets free the acetic acid; this again attacks, and is again set free; and so on until, in combination with some carbonic acid, it escapes through the ventilators. A careful scientific explanation would involve much more space, be somewhat different, but perhaps less generally understood. It is very evident, however, that the carbonic acid does not displace all the elements of the acetic acid, and that the oxygen therein and in the surrounding air plays a prominent part in the operation.

The lead for this operation must be cast; rolled lead will not corrode. Again, the slower the process, the better the pigment. Formerly dung was used to generate the heat and carbonic acid, but now the use of spent tan is universal. In the machinery for washing and separating the lead after corrosion, there are some parts patented, and some manufacturers are ridiculously secretive about their establishments; but in the main there is nothing new in the business, and any one desiring a more detailed description of the process can find it in MUSPRATT or URE.

There is, however, as in all kinds of business, much dependent upon good management. With American leads the trouble has been, want of care and too much haste. No American "corroded" lead has ever equalled the English B. B. in whiteness, body, or durability. An article, though lately come upon the market, entirely new in its chemical composition, and new in the list of manufactures, has surpassed the English and all others in body and durability, but is not yet equal to them in color. This peculiar substance, misnamed "Bartlett white lead," is made by a furnace process, and contains from 30 to 40 per cent. of a new salt of lead chemically combined by nature, and still more intimately by the action of the fire, with oxide of zinc. But as it is made by a similar process to that used for zinc white, we shall treat it more fully under that head. Its production, however, caused serious thought on the part of many manufacturers, and the idea has been suggested whether through a similar means of production the long hoped-for improvement on the old Dutch process for lead may not be reached.

The amount of corrosion which takes place in the lead varies with the season; too much heat makes it too rapid; much cold, while making slower work, and perhaps, better pigment, renders the manufacturer impatient. The yield of pigment obtained is nearly equal to the weight of lead put in; for, while only from 60 to 75 per cent. of the metallic lead is corroded, the gain in weight on that amount is about 25 per cent. It is stated that a temperature ranging from 100 to 120 degrees Fahrenheit is most favorable to perfect corrosion; that the heat inside the bins is much greater than that in our warm days of summer, there can be no doubt. The manufacture is unhealthy to those engaged in it; and few workmen can work at it steadily more than eight or nine months in a year.

The French process, as we have termed it, is but little if at all used out of that country. It is as follows: Litharge (oxide of lead) is dissolved in dilute nitric acid, and thence precipitated with carbonate of soda. Nitrate of soda, a very soluble salt, is formed, and remains in solution, while the carbonic acid set free unites with the lead to form a carbonate of lead. This is in brief the mode, though there are many manipula-

tions and patented variations. The pigment thus produced is usually very white, but is crystalline and transparent in structure. Millions of dollars have been spent on various patents—mere variations of the above—each claiming at last to have gotten *the thing*; but practical tests have ended in disappointment only. But a few years since, one of the most complete establishments this country ever saw was put up, to work under DELAFIELD'S patent, but it never turned out ten tons of saleable pigment. It is singular that with all its notorious caution capital will often engage in schemes which are so evidently against practical common sense. Yet there is much fascination in the prospect of accomplishing the work in as many days as it now takes months, and also of saving the great outlay of capital for immense space in buildings. Then, when the great quantity of white lead manufactured is taken into account, a saving of even one-quarter of a cent per pound amounts to over $200,000 annually. Of late years a noteworthy saving has been effected by many manufacturers in the mode of making and using their acetic acid.

Of the many patents, we shall instance one, from the beauty of its operation; but, at the same time, cannot say that it had any greater practical utility or value than the others. The lead was cast in thin sheets, 5x20 inches, and hung on wooden pieces inside of a glass-lined case. Vaporized acetic acid was admitted at the bottom until the lead was thoroughly covered; then carbonic acid, derived from vegetable substances, was let in. The acetic acid was vaporized by air pumped into it. One could stand outside the case and see the operation go on; and, when finished, the case had a magnificent frosted appearance. The lead was sometimes very white, and again poor; but it always cost more than the Dutch plan.

In the French process, a hydrated lead is made, or attempted to be made, by steaming; but never, by any means, has it been possible to imitate the composition and structure of that made in the old-fashioned way. The structure of the "Bartlett lead" is similar—that is, amorphous; but it is finer, and has a different look. It is due to Mr. CHADWICK, of Boston, who has a high reputation in the white lead trade, to say that he first discovered the peculiar structure of the new pigment, and its resemblance to his own product. With this exception, however, no other white pigment containing lead has the amorphous character.

In former times, it was the custom of the painters to buy their pigments in the dry state, and mix them with oil in their shops, in a rude mill or with a muller and stone. A few "old-style" tradesmen do this yet; but by far the greatest proportion of pigments are sold "ground in oil." While many corroders of white lead thus grind a part of their product, the greater part is consumed by firms who make this branch of the business a specialty. The mills used are generally the best character of French burr-stone. In this process, a well corroded white lead takes up about one and three-quarters gallons of linseed oil to bring it to the paste form in which it is usually sold. While there is no actual secret in this operation, the arrangements of various factories differ, as also does their machinery; and there is a certain amount of care and skill necessary in the operation. The theory of this mixture is, that the pigment forms a sort of soap with the oil.

ADULTERATIONS.

White lead in its dry state is seldom adulterated; but ground in oil it is extensively adulterated with oxide of zinc and sulphate of baryta. No dealer ever denies the fact; and a customer who buys *cheap* white lead cannot expect to get a pure article. There is no difficulty in buying a "pure and warranted" article, if the purchaser calls for it. There are mixtures of white lead, oxide of zinc, and baryta, which, from excellence of the proportions, hold together well, and have considerable reputation. This system of adulteration is less general now than during the war; and as prices recede, there may come a time when it will not pay to adulterate. There is no difficulty in detecting the adulteration by dissolving out the oil with ether; we usually use bi-sulphide of carbon, then the dry pigment, if pure, will easily dissolve in dilute nitric acid or acetic acid. Sulphate of baryta is insoluble, except in very strong and boiling acids.

AMOUNT OF MANUFACTURE.

It is estimated that at least 40,000 tons of white lead were produced in the United States last year; and of this, fully one-third was produced by four establishments in Brooklyn. The largest corroding works in this country are in this city. It is further estimated that about 700 tons of lead in oil were imported in 1869, and about 1,500 dry. The amount of pig-lead consumed in the United States the same year was over 30,000 tons, nearly all of which, as we have stated, is imported. The actual capital invested in the corroding business alone cannot be much less than $30,000,000; and fully 5,000 hands are regularly employed. If we look at the business incidental thereto, such as grinding, color making, and selling, the proportions of this industry are vastly enlarged.

Manufacture of Soda and Carbonate of Soda from Cryolite.

From the Report of J. LAURENCE SMITH, United States Commissioner to the Paris Exposition.

MANY and vain have been the attempts to supersede the process of Leblanc for the production of soda, and vast amounts of ingenuity and capital have been expended without success. But this statement does not apply to the production of soda, to a limited degree, out of a curious mineral found in Greenland called cryolite. This mineral was exhibited in abundance at the Exposition, and as there is an important manufacture of soda from it established at Natrona, Pennsylvania, the details of the method employed will be briefly described. These details have been kindly furnished to me by J. A. HAGEMANN, the chemist of the Danish Cryolite Mining Company, who directs at this time the manufacture of soda from cryolite by the Pennsylvania Salt Manufacturing Company. We may look for the best information on the subject to the above-named company's works, which are imitations on a large scale of the factory built by JULIUS THOMSEN, of Copenhagen, in 1856. Some information has also been obtained from an essay by SAMUEL F. SIMES.

CRYOLITE AND ITS SOURCE.

Before proceeding to a description of the process of manufacture, it is well to give some short account of this mineral and its present commercial movement.

The mineral cryolite, or "ice-stone," has been known as a mineralogical rarity for many years, as far back as the latter part of the last century; thirty years ago it was worth fully a dollar an ounce, and it was considered only as a rare and curious mineral, of no value in the arts. Up to 1850 no attempt had been made to put it to any practical use, although it was known to exist in Greenland in large quantities and to contain a large amount of soda, for its composition is—

3 Sodium	69
2 Aluminium	27.26
6 Fluorine	114
	210.26

It has a specific gravity of 2.95 with a hardness of 2.05. Much of it is found colorless and pure. The associate minerals are galena, blende, spathic iron ore, iron pyrites, and copper pyrites.

With the exception of some few scattered specimens that occur at Miask, in the Ural mountains, it is found exclusively in immense quantity. It is procured from the mines of Ivigtout on the west shore of South Greenland, on Arsuk Fiord, between Julian's Hope and Frederick's, latitude 61° north, longitude 48° west. The main deposit here forms a mass of six hundred feet in length and two hundred feet in width, and descending to an unknown depth. It lies at the base of granite hills, that rise a little distance from the edge of the Fiord, the shores of which are very bold and are almost fathomless a few feet from the shore.

The Danish government is the owner of this mine, and in 1864 Christian IX. granted the exclusive right of mining cryolite to the "Cryolite Mining Company of Handelshelhabet," a company organized in Copenhagen. This contract was made by a Danish company, in consequence of the results of the labors of a young Danish chemist, JULIUS THOMSEN, in 1850, who discovered a cheap and easy method of rendering cryolite available in technical chemistry for the manufacture of soda and alum, and his process is carried on in Europe and this country on such a scale as to consume annually twelve to fifteen thousand tons of cryolite.

PROCESS OF DECOMPOSING CRYOLITE.

THOMSEN'S process of decomposing cryolite is simply by lime, either the wet or dry way. The decomposition may be represented by the following formula:

$2 (Al_2 Fl_3 + 3 Na Fl + 6 Ca O) = 3 Na O + 2 Al_2 O_3 3 Na O + 12 Fl Ca$. Another method is to calcine finely-powdered cryolite and mix it with six equivalents of lime; the product will be "caustic soda, aluminate of soda, and fluoride of calcium." Another is to boil cryolite with the same proportion of lime in the form of milk of lime, and a similar decomposition takes place. The soda and aluminate are soluble in water; the latter is subsequently decomposed by carbonic acid. Both the wet and dry process will now be described.

The Dry Process.—The cryolite is dried in a furnace, and by a crusher is reduced to small fragments, which are ground in a burrstone mill to a fine powder, and uniformity in the powder is insured by passing it through a bolter of fine wire gauze. The powder is then mixed with slacked lime, or with pulverized chalk, in proportion to its purity, so that for each equivalent of pure cryolite there shall be a little more than six equivalents of lime. This mixture is effected on chaser mills, such as are used for crushing linseed and other oily grains. This mixture is now calcined, and here arises the great difficulty of the process, for the soda or carbonate of soda and fluoride of calcium fuse at a low temperature, and if allowed to fuse would almost entirely prevent the subsequent lixiviation with water. Care must therefore be taken to prevent the temperature from rising high enough to fuse the mass, while at the same time the mass must be heated sufficiently to effect the decomposition.

When the factory at Copenhagen was erected in 1856, this decomposition was effected in iron retorts similar to gas retorts, and set in the same way, and the carbonic acid so liberated (when chalk was used) was conducted to the vats to decompose the aluminate of soda from a previous operation. But this process entailed costly repairs, and much expensive handling. THOMSEN then constructed a furnace, which is now successfully used in all the cryolite factories.

It contains two fire-places at opposite ends. The flame from one of them passes *underneath* the hearth, which is formed of large slabs of fire-clay two feet square, and supported on square pillars. At this farther end, the flame meets the other, and both pass *over* the hearth, then rise and pass over the arch, and under an evaporating pan, to which they give off the last portions of heat. Finally, they pass into the flue of the chimney.

The mixture is spread on the hearth about three inches thick, and is not disturbed for about one hour, at which time it is turned over with a rake, and again left for about three-quarters of an hour, after which it is drawn out, and fresh material is introduced, each charge being about one thousand pounds. The decomposition should be complete in the portion withdrawn, and it forms a granular, loose mass of an ash color. After the mass has thoroughly cooled, it is lixiviated in an ordinary tank, and the dissolved soda and aluminate of soda is drawn off, and the residue is properly washed. The solution will, on an average, mark 26 to 28 degrees Beaumé.

The lye, being a strong solution of soda, carbonate of soda, and aluminate of soda, is treated with carbonic acid, in order to produce carbonate of soda and alumina. The carbonic acid is produced by the combustion of coke, and the products of combustion are drawn off by means of a fan, and passed through stacks filled with coke, down which water is made to trickle; and in this way the carbonic acid is washed and purified. The purified gas is passed from these stacks into a large horizontal cylinder, from forty to fifty feet long, through the middle of which a shaft with paddles rotates. The cylinder is about half filled with liquor, the paddles are put in motion, and the gas is let on through one end of the cylinder, the unabsorbed gases escaping at the other end. When the solution is saturated with carbonic acid, it is run off into settling-boxes capable of holding one charge. In about from four to six hours the alumina will have separated from the liquor which is drawn off, and the deposited alumina is freed from the adhering soda by washing it with water, and filtering upon proper filters. The clear solution first drawn off has a density of about 31 deg. Beaumé, and the alumina is left in the form of a granular powder. In this way two valuable products are produced from the cryolite—carbonate of soda and alumina. The latter contains but a trace of soda, and is a valuable material for the manufacture of alum and sulphate of alumina.

Considering the nature of the mineral and its impurities, sometimes amounting to 10 or 15 per cent., the carbonate of soda is remarkably pure, its only impurity being one or two per cent. of sulphate of soda, the sulphuric acid having been formed from the sulphides that are associated with the cryolite.

The Wet Process.—If cryolite be boiled with six equivalents of lime, the decomposition which takes place is similar to what occurs in the dry process; but if two equivalents of cryolite be boiled with fifteen equivalents of lime, the resulting product will be caustic soda, aluminate of lime, and fluoride of calcium.

$2 (Al_2 Fl_3 + 3 Na Fl) + 15 Ca O = 6 Na O + 2 Al_2 O_3 3 Ca O + 12 Fl Ca$.

In either case the decomposition is effected as follows: Into a large vertical cylinder, provided with a perpendicular shaft having paddles, and a steam-pipe, ending close to the bottom in a perforated ring, is introduced milk of lime, made from about fifteen thousand pounds of good lime. The paddles are now put in motion, and the mass is agitated for a little time, and the liquid is then assayed and measured, so as to ascertain the exact amount of lime present. The cryolite is then added in fine powder in the proportion desired to accomplish a given result. Two equivalents of cryolite, and twelve equivalents of lime will produce, as already stated, caustic soda and aluminate of soda. Fifteen equivalents of lime will furnish all the soda as caustic soda, with aluminate of lime. Fluoride of calcium is formed in both cases.

After two or three hours' boiling and agitation, the decomposition is generally completed (testing will indicate the liberation of all the soda), and the contents of the agitator are discharged on a suitable filter. The clean liquor which will form on top of the sediment is drawn off, and the sediment is treated with water as long as the filtered liquid contains soda.

If the first proportion of lime has been used, and aluminate of soda has been formed, the liquid is treated with carbonic acid, as in the dry process, and all the soda is converted into carbonate, and the alumina is deposited as an insoluble residue. If the latter proportion of lime is used, and all the soda be in the solution as caustic soda, all that it is necessary to do is to evaporate the liquid to dryness in pans or kettles. In this manner caustic soda containing 75 per cent. of NaO is manufactured on a very large scale at Natrona.

It is evident that the wet process is decidedly the simpler of the two, there being less handling, and less costly apparatus; but the feeble strength of the lye produced (10°B) by this process, and consequently the large amount of water to be evaporated, is a great drawback to it. Where alumina is of but little value, and caustic soda is much sought after, the wet process with fifteen equivalents of lime may be most profitably employed. Where the contrary is the case, the dry process is to be preferred, producing a lye of 26° to 28°B, and requiring but little concentration in order to crystallize.

Besides working out all the details of this process, JULIUS THOMSEN has devised volumetric processes of analysis adapted to different stages of the operation. WEBER & BRO., of Copenhagen, not only furnished all the means necessary for conducting his experiments, but established a factory in Copenhagen, and sent vessels to Greenland for the cryolite. Their factory has been the model on which others have been erected.

There are four establishments in Germany, consuming annually about 2,000 tons of cryolite; and in 1867 the one in this country was erected by the Pennsylvania Salt Manufacturing Company, having a capacity for working up about 6,000 tons of cryolite. This company, in 1867, imported 8,000 tons, and sent out to Greenland during the summer nineteen vessels of an average capacity of 450 tons, of which two were lost in the ice. The approach to the coast is considered dangerous on account of the fields of ice, which sometimes form a thick and impenetrable belt of eighty to one hundred miles in width. Off the western coast of Greenland the wind scatters the ice, and a good navigator can penetrate the openings without delay. No loss of life has yet occurred in this trade, as the ice affords a refuge for a shipwrecked crew until removed by the Esquimaux, or until they escape by their boats to the settlements. The mines are worked, from May to October, by about one hundred and fifty men. In the salt works of Natrona, Pennsylvania, more than half a million of dollars have been invested, and employment has been given to five hundred men. The alumina manufactured there in connection with the soda is supplied to the largest makers of alum in this country; but this will be referred to again under alumina. The various manufactures from cryolite have a market value of over $1,500,000 in gold.

There has been no important improvement on THOMSEN'S

processes, except it be one by G. A. HAGEMANN, on which a patent has just been obtained.

Beauxite (a mineral containing 80 per cent. of alumina) is sometimes mixed with the cryolite to increase the yield of alumina, and this process will be referred to under the part of the report relating to alumina.

Much space has here been devoted to this manufacture of cryolite soda, from the fact that cryolite and its products were conspicuous in the Exposition, and that the value of cryolite and its treatment, as a soda-yielding substance, is but little understood and appreciated by technical chemists generally.

Report of the Committee on Combustibles.

TO THE BOARD OF METROPOLITAN FIRE COMMISSIONERS:

Gentlemen—In relation to the matter pertaining to and under the supervision of the Bureau of Survey of Combustible Materials, we submit the following statement of the action taken during the past year:

FIRE PATROL.

The duties of the patrolmen detailed in each company district throughout the city, to make special examination and reports relative to the storage of dangerous combustibles, and the condition and probable hazard of danger (if any) of steam-engines, boilers, heating-apparatus, manufactories, and all places liable (from the peculiar condition of the premises or character of the business conducted there,) to more than ordinary danger or hazard of fires, have been performed in a very satisfactory manner, and with very beneficial results.

VIOLATIONS OF COMBUSTIBLE MATERIAL LAWS.

During the year ending November 30, 1869, the number of cases reported as violations of Combustible Material laws were		755
Of which were removed on notice and requirements of law complied with	566	
Proved upon examination no violations	163	
Referred to Superintendent of Buildings	25	
Referred to Corporation Counsel	1	
	—	755

KEROSENE OIL.

The limited quantities of kerosene oil allowed to be kept on sale or store at any one place, and the stringent enforcement of the regulations for keeping it, has proved an effective barrier against any serious conflagration from such cause, as but one fire of any considerable extent of the burning of kerosene oil has occurred since the last Report, and that the burning of the oil-tank on the dock foot of Sixty-fifth street, North river; so remote from all other property as to prove quite harmless.

The casualties, in loss of life and property and injuries to person, arising from careless handling and the use of inferior kerosene oil during the year, have been very great, averaging one fire or serious injury to person every day, and the loss of one life every week. In view of the very great danger arising from the use of impure kerosene oil for illuminating purposes, vigilant efforts to prevent its sale or use for that purpose, and the resulting disastrous consequences, have been taken by the officers of the Department and *attachés* of this Bureau. Its very general use throughout the city, and its sale in very limited quantities—of gallons, quarts and pints—by upwards of a thousand petty dealers, has imposed a very onerous duty upon the firemen detailed to make examinations and obtain samples, subjecting them often to insult, abuse, and threats.

The sale of compounds of benzine, naphtha, and kerosene, under the name of liquid gas—so named by parties claiming that by chemical and other processes their explosive and dangerous qualities had been destroyed—has resulted in most disastrous consequences, from the deceptive illusion in the minds of persons induced to use it, believing it harmless, when indeed its use proved most dangerous.

As there exists no law expressly against the infamous practice of palming the use of this explosive stuff upon the people, and it is doubtful whether the present laws governing the use of kerosene oil are applicable, great difficulty has been thrown in the way of fully protecting the public.

During the entire year, CHARLES H. CHESHIRE, specially detailed for the purpose, has been constantly employed in examining premises where kerosene oil is kept, and obtaining samples for testing its quality and has returned for examination 1,871 samples.

The testing of this large number of samples of kerosene compelled the employment of experts to properly determine the quality or grade of the oil. Mr. TAGLIABUE, Mr. SCHRIBER, and Mr. ROBERSON, have been employed for this purpose, and the Board, the better to enable all dealers endeavoring to ascertain the grade of kerosene in use by them by having the same properly tested, have permanently employed Mr. ELBERT ROBERSON, an efficient expert in testing oils, and all samples are tested whenever required, by whomsoever presented, and without charge.

The standard test fixed by law for kerosene oil is, that the fire test, or burning point, shall not be less than 100°, Fahrenheit. The Board have determined, for the purpose of accuracy, to use G. TAGLIABUE'S improved kerosene oil pyrometer in making the tests, believing it, from experiments made, to be the best and most accurate instrument that can be used for that purpose.

KEROSENE OIL SAMPLES TESTED.

The whole number of samples tested for the Department for the year 1869 was		1871
Number of tests on first samples	921	
Of which stood 95° F. and under	599	
" " over 95° F. and under 100° F.	141	
" " over 100° F.	181	
	—	921
Number of tests of second samples (from same parties)	950	
Of which stood 95° F. and under	143	
" " over 95° F. and under 100° F.	134	
" " 100° F. and over	673	
	—	950

In addition to this large number of samples of kerosene tested for the Department, several hundred samples have been tested for individuals.

FIREWORKS.

The sale and use of fireworks throughout the city and county during the months of June and July, annually, is a source of great danger of fires, and every possible precaution was taken to prevent fires from this cause; and, although not entirely successful, no serious losses occurred by fires originating from the sale or use of fireworks during the year 1869. The whole number of permits issued for 1869 to retail dealers to keep fireworks was 1,120.

All persons to whom permits were issued were compelled to conform to the strict regulations of the Department governing the keeping and sale of fireworks, and officers in every company district were detailed to see that they were entirely complied with.

GUNPOWDER.

Five matters of complaint against gunpowder and three seizures of gunpowder in limited quantities were made during the year, but, upon examination, the matters complained of proving irregularities instead of direct violations of law, they were adjusted in a satisfactory manner, and without litigation or forfeiture of property.

NITRO-GLYCERINE.

Two matters of complaint and seizure of nitro-glycerine were made during the year. The first case proving, upon examination, an improper seizure, the property was taken care of to prevent danger, and subsequently returned to the claimants. The second seizure proving, upon examination, a proper one, the nitro-glycerine was stored in the powder magazine under the Palisades, remote from the city, until properly sold and disposed of.

STOVE-PIPES, SHAVINGS, STREET FIRES.

Large numbers of complaints against dangerous stove-pipes, ash-heaps, shavings, street fires, and other petty cases of apprehended danger, have been taken up and examined during the year, upon the reports of the fire patrol, district officers, and complaints of citizens; and wherever found requiring action on the part of the Department, with a view of securing premises from liability to danger, the proper notices and orders have been issued, and immediate steps taken to secure beneficial results.

In all matters of examination and reports in connection with the affairs of this Bureau, great credit is due to the zealous and untiring efforts of the Board of Supervisers, Messrs. JOHN A. CREGIER, RICHARD P. MOORE, THEODORE KEELER, and JOHN H. FORMAN, as well, also, as to the patrolmen and district officers, to whom we severally return thanks for the efficient aid rendered.

Many modifications and amendments to the Combustible Material laws are requisite to the efficient promotion of the ends sought to be obtained in their enforcement, and we unite with the attorney to the Board in recommending that the draft of an amended code of Combustible Material laws, embodying many suggestions of utility in this connection, be presented to the Legislature for its action.

M. B. WILSON, J. M. McLEAN, } *Committee on Combustibles.*

Lyceum of Natural History.

DR. H. C. BOLTON'S paper on the "Rise and Fall of the Defunct Elements" was an interesting account of those chemical compounds which have from time to time been considered elements, and described as such by chemists. In this list were also included all the mythical substances which have from time to time been described and named, a very contradiction of terms being required to speak of them. Such mistakes have mostly arisen from haste and imperfect knowledge. The defunct elements are some forty in number. Many of them are probably unknown to the students of the present day, the only accounts of them being found in the periodical literature of the time.

Mr. PRIME'S paper on the "Treatment of Argentiferous Galenas" was unfortunately limited, on account of his ill health, to a brief verbal communication, after which Prof. J. L. NEWBERRY proceeded to read a paper on the "Ancient Lakes of Western North America, their Deposits and Drainage." The topographical changes of the western part of the continent have been extensive, and have deeply affected the animal and vegetable life once flourishing in regions now desolate. The tertiary deposits of the Atlantic slope, and some in the region of the Sierra Nevada, are marine; but the vast inland basins contain tertiary fresh water deposits, containing fossil plants in great numbers, and a remarkable series of animal remains. Among these the speaker mentioned two species of rhinoceros, the elephant, various horses, and the sabre-tooth cat, the tooth of which measures, in one specimen, eight inches outside of the jaw, the most formidable tooth of an animal of which we have any knowledge. These tertiary deposits of the West are made in fresh water basins, in a region where almost no fresh water basins can now be found.

Almost everybody going to California talks about chalk deposits. Following in the old emigrant train you will see various slabs of this chalk-like earth set up for grave-stones. These infusorial beds are portions of these fresh water deposits. On the western side of the Rocky Mountains the deposits are similar, and are rich in diatoms. The fauna are interesting. On the east side of the Rocky Mountains the tertiary deposits have been but little studied, although I have paid some attention to them. There are many beds along the upper waters of the Missouri. The banks of the Deschutes or Falls River, a tributary of the Columbia, show strata of volcanic ashes, "chalk," and beds of columnar basalt. The basalt frequently overlies the sedimentary beds.

The rivers of the inland basin run through a sort of table lands comparatively level, in which they have cut down deep cañons, the walls of which are sometimes 1,200 to 2,000 feet high, and nearly vertical. The conclusion to be drawn is that on both sides of the Rocky Mountains there were at one period vast fresh water lakes, covering an area many times greater than our present lakes (Superior, Michigan, etc.). The climate of the period was sub-tropical, and the fauna more abundant than in any part of the world at the present time. In that well-watered age, men lived, and vegetation luxuriated even in Greenland.

The Great Salt Lake Basin represents a series of such lakes, anciently fresh, but now salt, because of the lack of drainage. A large part of this basin now consists of alkaline plains, carried by the drainage from the mountains, the streams of which dissolved various salts in their course, and left them in the basin by evaporation. The central portion of the inland basin is not drained; but to the north and south the drainage by the Columbia and Colorado and their tributaries is good. The water must at one time have stood some four thousand feet higher than it now does. At the bottom we have the deposits of these deep fresh waters. Their ancient outlines can still be easily traced.

The Rocky Mountains are older than the Sierra Nevada, and were originally the coast range, the latter being under the ocean. The emergence of the Sierra made fresh water lakes in the central plateau, the drainage for a time flowing north and south between them. This is the period of the fresh water deposits. On the east of the Rocky Mountains these lakes reached from Texas far to the north, giving us immense fresh water formations, of which our present lakes are but miniature representations. As the drainage was cut off from the central basin, and the annual rainfall decreased, the undrained lakes became salt, and shrunk until the annual evaporation balanced the annual supply. This is now the case; and Salt Lake, though subject to minor fluctuations, is on the whole drying up. Professor NEWBERRY'S remarks, of which the foregoing is but an imperfect sketch, were received with interested attention; and a brief discussion followed, after which the meeting adjourned.

Remarks upon Specimens of Scale upon the Steamer "Ocean Queen."

NEW YORK, May 13, 1870.

Professor S. D. TILLMAN, Corresponding Secretary of American Institute:

DEAR SIR—Please accept this specimen of scale, sent you by express. It is a specimen taken from the boiler of the steamer "Ocean Queen," and is only about one-half its original size, in consequence of being broken on its removal from the boilers.

In order to set at rest the inquiry how so large a piece of scale could be got out of the boilers, I will say that the boilers were old, and were taken out of the ship and put on the dock, making room for a new set of boilers in their place. In cutting up the old boilers for removal to the iron-yard, I discovered this large amount of deposit, and had it as carefully removed as possible; this will account for the specimen being larger than could be gotten out of the man-hole.

Now, it must be taken into consideration that the engine of this ship had what is known as a "Pirson condenser," which was supposed to furnish three-quarters of the water necessary for the supply of the boilers with fresh water. In my opinion, this style of condenser completely fails to do, and has been generally abandoned by the merchant marine.

It will be noticed that the specimen is not one solid mass, but is probably an accumulation of years. The old boilers having been in use about ten years when taken out of the ship, much allowance must be made for the conduct of the engineer of the ship, who really had not sufficient time and help to thoroughly cleanse his boilers while in port, owing to the mistaken economy of the owners. Had the engine and boilers of the vessel been connected with the present type of surface condensers, and kept in proper order, no such sediment could possibly have been collected. All the ships of the Pacific Mail Steamship Company have the so-called "Sewell condenser," but the late Mr. SEWELL never claimed anything but the manner of packing the end of the tube, and his method of packing has been completely superseded by Mr. HORATIO ALLEN'S compressed wooden packing, obviating entirely the necessity of followers, etc., for securing the packing. They work to admiration in the above-mentioned steamer. These steamers produce a horse-power in their every-day work with 2.8 pounds of coal per hour. This is beyond doubt, as I gave all the data of logs, etc., to Mr. ISHERWOOD, and have his own record for the fact.

Of course part of this is due to the peculiar type of engine (American vertical beam); a part, no doubt, to model and shape, peculiar build, boilers, and much to a happy combination of all; but much is due to the condenser. At least twenty-five per cent. is saved by a surface condenser such as these ships have. I think owners of steamships stand very much in their own light when, contracting for new steamers, they do not stipulate for surface condensers. There is also fully twenty-five per cent. saved in a few years (or say, the life-time of a set of boilers) in the repairs of such boilers. With this kind of surface condenser a better vacuum can be obtained than with the jet condenser. I can certify to a vacuum expressed by twenty-nine inches with a syphon mercury gauge. Objections have been raised to surface condensers, on account of galvanic action. I do not hesitate to say this objection is very much over-rated. With the proper precautions, such as using cast-iron feed-pipes, and copper bends and tinned tubes, I have not experienced any trouble whatever. Much greater trouble to us has arisen from the imperfect manufacture of the tubes and other parts of our boilers.

Owing to the economy of space, tubular boilers are mostly used in steamers now; and to these, with the surface condensers properly made, no objection can well be raised. I would recommend the use of surface condensers even in vessels running on fresh water rivers. My reasons are, simply

that the use of pure water in the boilers makes them much more durable, and consequently more economical.

A proportionate increase of speed is doubtless due to the difference in vacuum made in the ordinary jet condenser and in a closed or surface condenser; the one injecting air constantly while in use, the other injecting no air except what enters by leakage. I sincerely hope the engineers of the Polytechnic will thoroughly investigate this matter, and correct me if I am wrong. I remain, most respectfully, yours,

W. W. VANDERBILT, 569 Broadway.

MINING SUMMARY.

New Mexico.

THE NEW SILVER MINES.

Discoveries have recently been made in New Mexico which reveal the existence of a vast deposit of silver ore that is said to surpass, both in quantity and quality, all the stores of this precious mineral yet found in America. From correspondents of the Philadelphia *Press*, whose reliability seems to be unquestioned, we have derived some particulars relative to the "Virginia silver mining district" that cannot fail to interest our readers. This district is located in the county of Grant, New Mexico, near what are known as "Leitzendoffer's wells," some thirty miles east of the Arizona line, and about one hundred and thirty from Mesilla. It is a chain of mountains between the Burra and Chirricauhua ranges, in latitude 32 and longitude 108½. The mines were discovered on the 2d of February last by Messrs. Brown, Arnold, Harris and McAllen, a company of prospectors in the employ of San Francisco capitalists. Brown and Arnold took seventy pounds of ore from different localities, and all on the surface, carried it to San Francisco, and had it assayed. It yielded pure silver at a rate of from $20 to $4,000 per ton, averaging $200 per ton. The main ledges are from twenty to one hundred feet in width, and in many places crop out fully fifty feet above the ground. Unmistakable indications prove that these mines have been worked a long time previous, but by whom is a mystery to the present generation. A stone cabin, with cedar rafters and clay roof, has been found, and also a tunnel forty feet in length, from whence the ore has been excavated by the miners of a bygone era. In richness and extent this district is considered far beyond the Washoe region, and experienced persons declare that there is nothing to equal it on the continent. Water sufficient to supply one thousand people can be brought from Leitzendoffer's, five miles distant, and by digging the quantity can be largely increased. At the mines there is enough water for drinking purposes, and the Ceinega de San Simon, a neighboring stream, will furnish it to run at least five hundred stamp mills. Building timber exists in abundance at the Burro mountains, twenty-five miles distant, where saw-mills will soon be in operation, and fuel can be had within a range of twelve miles. The excitement which these discoveries have caused in California, Arizona and New Mexico will be the means of directing the tide of emigration to that quarter, but men without capital may as well delay the going until the mills and furnaces, now *en route*, shall have arrived and gone into operation, although all that is necessary to procure the ore itself is to put blasts in the face of the enormous ledges, and tumble it down literally by the cord. Rival companies from San Francisco have already staked out their claims, and, as usual, there are conflicts in regard to the titles. Troublesome times are anticipated, and Governor Pile has been called upon to secure the services of the United States troops at Fort Bayard to interfere and preserve order if necessary.

MORE ON THE "BURNS" MINES.

From the Tucson *Arizonian*, of April 9th, we take the following statements, which we would not like to endorse by declaring reliable:

"WE HAVE FOUND IT!

"The greatest treasures ever found on this continent, and doubtless the greatest mineral treasures ever witnessed by the eyes of man. As regards their location, there is, however, a doubt, it being stated by some that they lie a few miles west of the boundary line between the two Territories, and by others that they are east of the line. It is, however, a matter which involves more of curiosity than of real interest as to the Territory in which they are situated. So long as their existence is a decided fact, they will be certain to cause immigration, and thereby bring about the early development of this Territory.

"RUINS OF HUMAN HABITATIONS.

"No person who has travelled through Arizona will deny that it exhibits a better appearance, as a gold and silver country, than any other place on this continent. And not only in a geological point of view has this appearance manifested itself; for, if we turn our attention to the past, and look for evidence from the work of others who were here in past ages, we find records of an imperishable type, left by the hands of men, but of what race, or at what date, must, perhaps, ever remain a mystery. North of the Rio Gila, in the wildest, the most unknown and desolate districts of the Territory, the explorer frequently meets with ruins of human habitations—the style of architecture going to prove that such were not the habitations of the present worthless race of people generally regarded as aborigines. In the neighborhood of the mines are also frequently found a peculiar class of ruins which, judging from the evidences that the stones of which they were built betray, of having been submitted to the action of fire, are supposed to be those of smelting furnaces of an obselete pattern.

"OLD EXPLORATIONS.

"The mines under consideration furnish another evidence of early explorations made among the mineral districts of Arizona. At several points the rock bears evidence of having been hammered by rude implements, while detached fragments strewn around at such places show that the miners were not altogether unsuccessful. At one point, where the rock is of a shattered character, a cave or tunnel has been discovered. Upon removing the loose stones by which the entrance was partially concealed, the horizontal depth was found to be about seven feet. On either side the rock was found to be of a solid character, and wonderfully rich. About one hundred yards from the main lode stands the ruins of a stone building of an exceedingly rude style of architecture. This building would doubtless long since have been reduced to a shapeless mound were it constructed on the usual plan found to exist in the other ruins; but its walls are infinitely more massive, and seem as imperishable as the rock itself. On the whole, the structure is one which naught in nature, save the shock of an earthquake, could be considered sufficiently powerful to disturb. The cedar timbers of the roof are still in a good state of preservation, and might, in their present situation, remain so for centuries, removed, as they are, from the ground, and exposed to no other destroying influences than those of wind and rain.

"EXPULSION OF THE JESUITS AND ABANDONMENT OF THE WORK.

"One of our old men, a Mexican, now in his sixtieth year, and who was born upon the spot where he now lives, says he remembers the time, while he was yet a boy, when the inhabitants went regularly to the mountains with their burros, and, after an absence of three days, returned—the large bags, made from cowhides and slung across the backs of their animals, filled with silver-bearing rock. This rock was then put through a process of smelting, each cargo yielding about five pounds of silver. He believes the mines from which this rock was taken to be inexhaustible, and says the work was not abandoned until the time that the Jesuits were expelled from Arizona. About that time the Indians arose and butchered about a hundred of the inhabitants; the work was then abandoned, and as the Indians have ever since continued hostile, was never resumed.

"AN IMMENSE MASS OF SILVER.

"Professor Lamborn, discoursingupon the characters of silver ore, speaks of a mass of virgin silver weighing 2,700 pounds, which was found near the Mission of San Xavier del Bac (nine miles from this town), that records are extant in the archives of Spain, showing that suit was brought by the crown officers to obtain the mass of silver from the owners—pleading that it was a public curiosity, and, therefore, should belong to the king.

"GOLD AND SILVER EVERYWHERE.

"When we consider the many evidences which we have seen, and the many reports which have been confirmed to our satisfaction, we cease to doubt the existence of immensely rich deposits of the precious metals in the neighboring mountains. In these mountains lie the marvellous discovery before referred to as necessary to give an impetus to mining pursuits in Arizona. Of the explored parts of the Territory, a tract of land ten miles square cannot be found in which gold and silver may not be discovered, and much unknown wealth will doubtless be brought to light within the next few months by miners who have already commenced flowing into Tucson, and hence into the mountains south and east. This will prove the most effective warfare ever conducted against the Apaches; for miners will not suffer themselves to be driven off by savages when fame and fortune promise to reward courage, perseverance, and industry."

California.

SOMETHING ABOUT OUR GOLD MINING.

There is food for thought in the following remarks by our excellent contemporary, the San Francisco *Bulletin*—the representative journal of the Pacific coast:

"Our gold product has fallen off during the past eight years from $32,000,000 to $23,000,000 annually. The yield of 1865, for which the geological survey computed mining statistics, was $28,500,000, divided as to source whence derived—quartz, $6,500,000; placer and gravel, $21,000,000. The yield *per capita* of men employed was not actually ascertained; but in order to pay ruling mining wages, $60@70 per month, the rate must have exceeded $720@840 per year. Since that date the amount yielded by quartz mining has slightly increased, and may be estimated at about $7,000,000. The yield from other sources has in the same time fallen off from $21,000,000 to $16,000,000. In 1865, the yield of gold in Australia *per capita* was: alluvial miners, $323 32; quartz miners, $461 36. The aggregate annual net profit of our quartz mining interest is not known, but it is known to be small. In comparison, the gold quartz mining in Australia shows to advantage, and forecasts the value of this interest in California. We have not at hand any of the later Colonial Commissioners' Reports (subsequent to 1865), which are of great interest and value. But, referring to the local share-lists, with their accompanying memoranda of dividends, etc., we see that this branch of mining is there, beyond all comparison, more profitable and flourishing than in California. The wages paid for all but the more responsible employees, are less than half the California tariff; while for the chief mining and mechanical engineers and managers the wages are about equally high. Its effect is manifest in this: That several of the largest mining properties, paying large profits, show a yield per ton which—after reducing the California expense accounts by the difference in pay roll—would still net a handsome loss. Precisely how much of this adverse balance is due to difference in the cost of fuel, material, etc., cannot be stated. In most of these items equally the element of dear labor enters into their production and cost. Quartz miners' and mill men's wages have averaged with us $4 per day, and laborers $2 50 and $3. Thus we may perceive how it is that while quartz mining has actually yielded more per hand employed than placer mining or washing, the wages paid have devoured almost the entire substance produced. Thus this interest, while not actually languishing, has undergone little development; and in this condition it now remains. Nor can it be redeemed until the laborer will be content with something less than the entire product of his labor.

"There are, throughout the gold quartz belt, a number of idle properties which have been proved by experiment to yield just enough to fail to pay. The number of properties in this category is very considerable. There are, of course, an abundance of abandoned mines which have given no promise of paying at all; but the number which have been actually proved capable of paying a profit at Australian wages, is not at all realized by the mass of people unfamiliar with the quartz belt. In almost every mining camp, and in isolated deserted cañons, the dilapidated 'mills' stand as melancholy monuments of enterprise and failure. Near at hand, a pit half filled with water, surmounted by a crazy windlass and the last yard of rope which the miner was too careless to cut off, or a dismal cavern haunted by bats and fat venomous spiders, show the abandoned tunnel or shaft. The history of these enterprises is remembered in the neighboring camp and repeated with advantages to the 'capitalist from 'Frisco'; and its record is preserved in the ancient bullion books of the local assayer. Probably even in the mining counties themselves, only those few who may have travelled the State from Siskiyou to Mariposa, realize the aggregate number of these properties which will 'almost' pay, and in the path of whose prosperity stands the single item of excessive wages. They will not pay now. Wages have not yet declined. Had the volume upon this subject been published, the compilation and preparation of which was a portion of the Geological Survey's labors, it might while contributing nothing directly to modify the economical condition upon which labor prices depend—have wrought silently a valuable work in preparing men's minds for such a condition of affairs as has now arisen in California—in showing them the field of labor which lay at their hand awaiting precisely such a condition of affairs as has now arisen in California—in showing them the field of labor which lay at their hand awaiting precisely such a condition of affairs before it could be tilled, and giving them courage at a time when old industries were depressed and old things were passing away, to betake them with energy to the new things which lay before them. However, in the slow grinding of the eternal mills this will be brought about, and there is a future for the particular industrial interest which is at present, of all in California, the most depressed.

"It does not follow hence that the yield of gold shall be increased, for the decline in its product, as already noted, has been in the placer mining or washing. When the yield from quartz mining shall increase, it will serve in part to counteract this decline. Any conjecture as to the aggregate yield at any point of future time would be mere speculation, and altogether valueless. In the nature of the case, no estimate upon the subject can be made. Of the total bullion product of the territory lying west of the Rocky Mountains, we need not undertake here to speak. U. S. Commissioner Raymond's reports are instructive, reliable and valuable. No one can regret more than the accomplished Commissioner that the imperfection of local statistics of all kinds, and their more frequent entire absence, leave our information upon many branches of the subject in a condition far from satisfactory or complete. Such information would possess a national value, and can be procured only by systematic local compilation. A summary of the whole matter is this, however, that while we may not anticipate important increase in our production of the precious metals during the next few years, we may expect that production to be steadily progressive; and we have sufficient grounds for anticipating that it will have attained five years hence to a figure exceeding any one of the ten last past. Quartz mining in California seems to give the following outlook: We may not expect a reduction for many years to the Australian scale of wages. It may be doubted whether so considerable a reduction would be desirable or for the best interests of the country. But the mining counties are full of idle men, and all their interests are languishing. Up to this date, these men refuse to go to work at any reduction whatever upon the old excessive scale of wages. This is a condition of things which in their own nature cannot go on. With the first concession of a dollar a day in wages, mining will receive an immediate impulse. The old shafts will be cleaned out, and in very many the quartz will be found to pay. Every mining man is aware of properties of which this statement is true. Local capitalists are abused for not promoting mining development. It is notorious that local capital has a 'hankering' after mines, and will go into them where there is any encouraging prospect of success. At present there is no such prospect. But foreseeing that a concession in the rate of miners' wages is impending, it is easy to foresee and to predict a great revival in the quartz mining interest of California before the close of the year 1871."

Pennsylvania.

STATUS OF THE COAL TRADE.

The status of the coal trade and of affairs in the five counties of Luzerne, Schuylkill, Carbon, Columbia and Northumberland from the most reliable information within the reach of the press, is thus summed up by the Scranton *Republican* in a comparatively small space. Luzerne county is the only one included in the district in which all the men are at work—or, at least, so nearly all that none are officially reported as out to the General Council of the Union or Workingmen's Benevolent Association. Luzerne employs nearly 12,000 miners, and that these are all at work is a matter of sincere congratulation. Next in prominence comes Schuylkill county with her 10,000 miners, and with the exception of only some 300, who were at work on the first of this month, all are idle. These 300 are working on the basis of 1869. But this small force is so inconsiderable when taken in connection with nearly 10,000 idle men that it amounts really to a suspension. In Carbon county about 500 men are working, and nearly 2,000 are idle. In the Carbon region, as near as we can ascertain, all the collieries are at work with the exception of the mines operated by the Lehigh Coal and Navigation Company, situated at Summit Hill and Nesquehoning. Ten days ago it was thought probable that a compromise would be effected between the company and the men, but the latter have declared their determination not to mine a ton of coal unless the increase demanded by them be granted. Thus far the company have shown no disposition to yield, and well-informed gentlemen from the Summit Hill region informs us that there is no prospect of a resumption for a considerable time. The number of men idle in Carbon is not by any means the number necessary to operate the mines, for large numbers have left these regions and sought employment elsewhere. Under the present suspension at the Summit mines the only tonnage by the Lehigh Canal is that of coal from the Beaver Meadow and Wyoming regions, transferred from cars to boats at Coalport and East Mauch Chunk. Many of the boatmen on the Lehigh Canal, in consequence of the poor prospect for the season, have moored their boats and are employing their teams on farms. Columbia county has nearly 1,000 miners, all of whom are idle. Columbia has invariably been reached by the Schuylkill troubles, and suffers or prospers with that locality. In Northumberland about 800 are working, and 1,000 idle.

It will be seen that outside of Luzerne county, of about 15,000 men only a little over 1,000 are at work. The 12,000 men in this county are literally supplying the anthracite market, and besides supporting themselves and families are aiding largely in supporting over 13,000 idle men, to say nothing of keeping railroads with their thousands of employés busy in transporting the products of their labor and industry.

But there is still another phase to the present status of the coal business. Notwithstanding the fact that thousands of miners are to-day idle, and the production of coal decreased in proportion, the supply is apparently sufficient to meet the demand at moderate prices, and this is so from the fact that only what coal is positively needed is at present bought, the prospect of a general resumption carrying with it the probability of a further decline in prices. Should the operators in Schuylkill, Carbon, Columbia and Northumberland counties accede to the demand of the miners and set them at work, the production of coal in this State would be nearly or quite doubled. The throwing of this increased production upon the market would certainly have the tendency to depress the market prices from their present standard, and every thoughtful man must be able to see that the present condition of the coal trade will not warrant any advance in the cost of production. The status of the trade is entirely and strongly against any advance in wages, and the men who are standing out for increased pay had better go to work at the best prices they can get. If they do not they are quite likely to find their whole occupation gone.

BUSINESS AND PERSONAL.

[*Short notices in this column fifty cents per line each insertion.*]

GLYNN'S ANTI-INCRUSTATOR FOR STEAM BOILERS.—THE only and reliable article for removing and preventing incrustation. No foaming, and does not attack metals of boiler. Liberal terms to agents. C. D. FREDRICKS, 587 Broadway, N. Y.
April 19 tf.

MARKET REVIEW.

The Coal Trade.

NEW YORK, May 20, 1870.

WHOLESALE.—The 83d auction sale of Scranton coal is announced in our columns this week, to take place on Wednesday next, the 25th inst. 80,000 tons are to be sold. The market at the present writing is very weak indeed and trade is extremely dull. Lehigh coals seem to hold their own, and the large sizes are particularly sought after. We hear of Scranton coal offered at prices below those obtained at last sale. There is no accounting for the extreme dullness except it be the determination of every one in the trade to keep prices low, in order to sustain the operators in the Schuylkill region. Capital has resolved no longer to be dictated to by labor, let the cost be what it may. We cannot estimate what the average decline may be at the Scranton sale on Wednesday, but we understand that the Pittston Company have forthcoming a new circular which will in all probability knock the bottom out of every thing. This circular may be issued to-morrow, in which case if they take the stand we learn they intend to, will make a great difference in the prices bid at the sale. Of course there is not much reliability to be placed on rumors, but every feature of the trade confirms the reports.

The gossip of the week among coal dealers has been particularly upon a case at law, reported below, and which we publish for the purpose of having the same on record. The sympathies of the trade generally are with Messrs. WHITE, FOWLER & SNOW, who are known in business circles as men of the strictest integrity, and who seek no undue advantage at the cost of any person. They were the first of our leading coal dealers to institute a system of "written contracts" of all business operations in coal, and of course intend to sustain the dignity of their offspring, as will be shown below. The days are gone by when any business as huge as the coal trade can be entirely governed by old customs. If it was a custom years ago to deliver on a contract just as much coal as one chooses and then stop, it is put an end to now. A precedent has been established correcting this, and all lay themselves liable to damages who try to avoid taking or delivering coal according to contract hereafter. Heretofore, if the price of coal declined, the party to whom the coal was sold, by custom, could take little or none, as he pleased. If the price advanced, the seller could decline, as he saw fit. We think, upon the whole, that the decision rendered below will have a healthy effect upon the trade, and cause all parties to be more particular in their business transactions.

SUPERIOR COURT.

Before Justice Jones and a Jury.

BREACH OF COAL CONTRACT—RECOUPMENT.

WM. H. TALLMAGE & Co. *vs.* WHITE, FOWLER & SNOW.—The plaintiffs bring this action to recover an amount due for the sale and delivery of a quantity of coal. They alleged that between July and November, 1868, they delivered to the defendants coal valued at $28,310, of which amount the defendants paid $23,859, leaving due $4,451.

The defendants admitted this, but claimed that all this coal was delivered in pursuance of seven written contracts, whereby the plaintiffs had agreed to deliver to the defendants in all 3,700 tons of coal; that they had actually delivered to the defendants the coal alleged in the complaint, about 1,700 tons; that they had failed to deliver the balance, viz., 2,000 tons, and that the difference in value of the undelivered coal at the time of sale, and the commencement of the suit was $3,943.

The defendants moved for a judgment on the above facts, and on the further ground that these several contracts were entire contracts, and that the plaintiffs could not in any event recover on either contract until they had proven an entire performance and delivery under that contract.

The Court directed a verdict for the defendants, with $100 allowance, and gave plaintiffs thirty days to make case. Stay meantime.

SUPERIOR COURT—TRIAL TERM—PART I.

MAY 19.

Before Judge Jones and a Jury.

BREACH OF COAL CONTRACT.

JOHN WHITE *et al. vs.* WM. H. TALLMAGE *et al.*—This action grows out of the coal transactions set out in the case of Tallmage *vs.* White, and is in the nature of a cross action. The plaintiffs purchased of the defendants about 3,700 tons of coal by seven different contracts in writing. The plaintiffs alleged that only about 1,700 tons had been delivered under these contracts, and that they were entitled to recover the difference between the value of the 2,000 tons which were not delivered at the contract price and the market value of the coal at the time when it should have been delivered. The defendants claimed that the last one of the contracts was made by one Foxwell, without their authority, and that they gave the plaintiffs notice to that effect the next day; that they had offered to deliver all the coal to the plaintiffs, who had refused to receive it, which was denied by the plaintiffs. All the contracts were made and signed by Foxwell, and plaintiffs proved that they had no notice of the revocation of his authority up to the time of the making of the last contract, and that coal rose in value between the making of the contract and the time when the coal ought to have been delivered, about $2 per ton and upward.

The Court directed a verdict for the plaintiffs for $4,503 26. Exceptions to be heard in the first instance at General Term.

RETAIL.—There is a fair trade doing. No change in prices.

FREIGHTS.—There is not an over supply of vessels, but rates are much lower. We quote: Boston, $1 65; Providence, $1 40; New Haven, $1.

Anthracite Coal Trade for 1869 and 1870.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending May 15, 1870, compared with week ending May 14, 1869.

COMPANIES.	1869. WEEK.	1869. TOTAL.	1870. WEEK.	1870. TOTAL.
*Phils. & Reading R.R.	548	1,173,186	36,564	906,293
Schuylkill Canal	16,673	180,530	2,854	25,163
Lehigh Valley R. R.	11,726	947,890	64,431	1 180,470
L. Coal & Nav. Co. R R.	12,083	298,766	23,359	342,361
Lehigh Canal	15,104	170,043	12,364	47,770
Scranton North	13,180	195,050	13,458	227,668
" South	25,104	564,902	38,179	637,539
Penn. Coal Co., rail	17,647	293,613	21,486	383,695
" " canal	1,184	3 318	725	2 975
Del. & Hud. Canal Co.	44,161	241,223	56,393	277,858
" " R. R.	3,945	97,577	5,623	134 988
" " south	4,050	4 ,585	14,784	126,531
Shamokin	5,034	134,598	8,692	108,738
Trevorton		7,054	2,505	24 92
Lykens Valley Coal Co.	1,199	18,031	3,8.9	12,695
Wyoming South	7,600	:9,737		
" North				
P. N. Y. C. & R. R. Co.			4,842	109 879
Williamstown, Col'y.	1,250	66,602	7,440	95,899
Short Mountain		26,614		
Total	180,468	4,522,219	321,512	4,755,781
1869			180,468	4,522,219
Increase week and year			141,044	183,562

* Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1869 and 1870.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending May 14, 1870, compared with week ending May 15, 1869.

COMPANIES.	1869. Week.	1869. Year.	1870. Week.	1870. Year.
B. & O. R. R.	23,044	303 692	20,250	274,239
C. & O. Canal	16,656	111 419	19,739	105 722
H. & B. T. R. R.	7,726	115,194	8,037	104,526
Harrisburg & D.			15,256	212,971
L. V. R. R.		552		5,156
P. & N.Y.C. & R. Co.			6,146	78,0.9
	47,426	430,857	69,428	780,624

Schuylkill Coal Trade.

Report of Coal transported via the P. and R. R. for the week ending May 12, 1870—less coal carried for Company's use, and Bituminous Coal:

For week	36,564 07
Previously this year	869,729 04
Total	906,293 11
Same time last year	1,173,186 00
Decrease	266,892 09
Amount sent same week 1869	548 00

Report of coal transported on the Philadelphia and Reading Railroad for the week ending Thursday, May 12, 1870:

From St. Clair	2,654 14
" Port Carbon	1,795 03
" Pottsville	122 26
" Schuylkill Haven	22 847 12
" Auburn	1,063 09
" Port Clinton	3,325 09
" Allentown and Alburtis	4,725 07
" Harrisburgh and Dauphin	15,256 06
Total paying freight	51,820 13
Coal for Company's use	3 677 08
Total for week	55,497 01
To same time last year	1,120,613 11
Total	1,176,141 12
To same time last year	1,432,619 14

Report of coal transported over the Schuylkill Canal for the week ending Thursday, May 12, 1870.

	Tons. Cwt.
From Port Carbon	1,144 00
" Pottsville	165 —
" Schuylkill Haven	1,476 09
" Port Clinton	69 —
Total for week	2,854 09
Previously this year	22,709 02
Total	25,563 11
To same time last year	180,530 03

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company, for week ending Saturday, May 14, 1870.

	WEEK.	SEASON.
North	43,738 10	821,829 02
South	14,784 05	126,530 15
Total	58,522 15	948,359 17
Corresponding time in 1869.		
North	27,956 18	692,974 02
South	4,049 19	41,868 19
Total	32,006 17	734,433 01
Increase North	15,781 12	Increase 128,855 00
Increase South	10,734 06	Increase 84,661 16
Total Increase	26,515 18	Increase 213,516 16

Report of Coal Transported over Lehigh Valley Railroad

For the week ending May 14, 1870, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	PREV'LY. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	13,448 14	256,649 05	270,117 19
" Hazleton	45,021 10	691,414 13	736,436 03
" Upper Lehigh	221 00	4,973 00	5,194 18
" Beaver Meadow	17,266 00	226,552 08	243,818 08
" Mahanoy	3,437 00	98,661 07	102,098 07
" Mauch Chunk		447 17	447 17
Total Anthracite	79,415 02	1,278,704 10	1,358,119 12
Bituminous Coal recv'd from Cats. R. R.			
N. C. R. R.			
E. P. R. R.		5,156 00	5,156 00
P. & N.Y. C. & R.R. Co			
Fall Creek			
Schroeder			
Towanda			
Total by rail and canal	79,415 02	1,283,860 10	1,363,275 12
Same time last year	19,632 14	1,045,967 10	1,065,600 04
Increase	59,782 08	237,893 00	297,675 08
Decrease			
Forwarded East from M'h Chunk by rail	64,431 06	1,116,039 08	1,180,470 14
Same time last year	11,726 04	936,164 09	947,890 14
Increase	52,705 02	179,874 19	232,580 01
Decrease			

RECAPITULATION.

Forwarded East from M'h Chunk by rail	64,431 06	1,116,039 08	1,180,470 14
To N. C. R. R., at Mount Carmel		115 00	115 00
Forwarded North from L. & B. Junction	4,837 10	104,617 09	109,454 19
To L. & S. R. R. at Packerton for rail	91 11	3,354 08	3,445 19
Delivered at M'h Chunk	11 12	540 09	552 01
Delivered on line of road above Mauch Chunk	90 00	6 272 06	6,362 06
Delivered above M. Chunk for use of L. V. R. R.	1,134 10	22,192 01	23,326 11
To L. & S. R. R., at P'n Hav., for railroad			
Do. for canal	5,780 09	15,597 15	21,378 04
At M. Chunk for canal	3,038 04	9,975 14	13,013 18
Total Anthracite	79,415 02	1,278,704 10	1,358,119 12
Bituminous Coal		5,156 00	5,156 00
Total all kinds	79,415 02	1,283,860 10	1,363,275 12

Penn. and N. Y. Canal and Railroad Co.

REPORT of Coal Transported via the Pennsylvania and New York Canal and Railroad Company, for week ending May 14, 1870:

	WEEK.	PREVIOUSLY.	TOTAL.
Anthracite	4,842 10	105,037 07	109,879 17
Bituminous	6,146 00	71,873 00	78,019 00
Total, Ant. and Bit.	10,988 10	176,910 07	187,898 17

Report of Coal Transported by the Lehigh Coal and Nav. Co.'s Railroads and Canals,

Week ending May 7, 1870—Compared with same time last year.

WHERE SHIPPED FROM	WEEK, 1870. tons cwt.	WEEK, 1869. tons cwt.	YEAR, 1870. tons cwt.	YEAR, 1869. tons cwt.
Wyoming Region	4689 07	1726 15	36 642 16	24 224 03
Upper Lehigh Region	2317 18	530 19	3953 00	5652 19
Mahanoy Region		141 09		858 01
Hazleton Region	5945 10	4258 14	7457 16	6252 03
Beaver Meadow Region	3032 04	1829 03	12 79 09	2 410 01
Mauch Chunk Region		5471 18	3089 12	14 842 01
Totals	43281 19	25850 09	468 86 19	500706 07
Increase				
Decrease	15431 13		31819 08	
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	23350 14	12093 15	312261 06	298766 02
Forwarded East of Mch Chunk by Canal	12 02 05	15191 01	4777 03	170343 11
Delivered at and above Mauch Chunk	1112 08	284 02	14125 14	14387 00
Delivered to L. & B. R. R. at Plymouth Bridge	6447 12	352 18	64623 11	12459 11
L. V. R. R. at Sugar N.				5160 01
Totals	43281 19	25850 09	468886 19	500706 07
Of the above there was from Mines controlled by Co., W. B. C. & L Co	14296 04	5949 03	14 947 01	122054 11
L. C. & N. Co	93 16	5941 07	46 43 15	118412 01
Totals	14389 01	11 21 15	193990 16	240936 12
Increase				
Decrease	2703 05		46995 16	

Harrisburgh and Dauphin Coal Trade.

The following is the amount of Bituminous Coal transported via the P. and R. R. for the week ending May 12, 1870:

	Tons.
For week	15,256 06
Previously this year	197,715 02
Total	212,971 08

Shipments of Cumberland Coal

for the week ending Saturday, May 14, and for the year 1870:

SHIPPED BY	B. & O. R. R.	C. & O. CANAL.	TOTAL.
Cooke M.	338 06	.....	338 06
Borden	1,607 02	2,365 06	3 972 08
Consolidation	4,326 08	8,182 03	12,508 11
Spring Hill	237 18	.....	237 18
Midlothian	.....	698 05	698 05
H. and Baltimore	270 09	1,347 04	1,617 13
G. C. C. and I.	2,572 02	701 11	3,273 13
Maryland	2,240 10	6,002 08	8,242 18
American	1,979 09	4,327 19	6,307 08
Atlantic	551 13	.....	551 13
Piedmont	1,639 17	.....	1,639 17
Swanton	888 01	.....	888 01
Barton	1,062 00	.....	1,062 00
Potomac	1,738 15	.....	1,738 15
Franklin	2,774 02	.....	2,774 02
Big Vein	1,208 06	.....	1,208 06
Total week	23,434 18	23,624 16	47,059 14
Previous	302,481 06	105,483 01	407,964 07
Total year	325,916 04	129,107 17	455,024 01

Statement of coal transported over the Cumberland and Pennsylvania Railroad during the week ending Saturday, May 14th, and during the year 1870, compared with the corresponding period of 1869:

WEEK.

YEAR.	C. & O. CANAL. Tons.	C. & O. CANAL. Cwt.	B. & O. R. R. Tons.	B. & O. R. R. Cwt.	TOTAL. Tons.	TOTAL. Cwt.
1870	19,739 04		20,250 09		39,989 13	
1869	16,656 15		23,044 02		39,700 17	
Increase	3,082 09				288 16	
Decrease			2,793 13			

YEAR.

YEAR.	C. & O. CANAL.	B. & O. R. R.	TOTAL.
1870	105 722 05	274,230 04	379,952 09
1869	111,419 05	303 692 04	415,111 11
Increase			
Decrease	5,697 00	29,462 02	35,159 02

Prices of Coal by the Cargo,

[CORRECTED WEEKLY.]

	AT NEW YORK, May 21.			AT PHILADELPHIA, May 21.	
SCHUYLKILL.	R. A.	W. A.	R. A.	W. A.
Lump	$ — —	$5 00	4 50	— —
Steamer	— —	5 25	— —	— —
Broken	— —	— —	— —	4 50 to — —
Egg	5 75 to 6 25	5 50	— —	4 50 to — —
Stove	— to —	6 00	— —	4 50 to — —
Chestnut	4 50 to 5 00	5 00	— —	4 00 to —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	6 00	— —	— —	— —
Broken	6 00	— —	— —	— —
Egg	6 00	— —	— —	— —
Stove	6 25	— —	— —	— —
Chestnut	5 50	— —	— —	— —
Pea		— —	— —	— —
SPECIAL COALS.*				
Diamond Vein	R. A.	— —	— —	— —
New England	"	— —	— —	— —
Locust Dale	W. A.	— —	— —	— —
Honey Brook, Leh	W. A.	4 75 to 5 75	— —	— —
Spring Mountain	"	4 75 to 5 75	— —	— —
Sugar Creek	"	4 75 to 5 75	— —	— —
Sugar Loaf	"	4 75 to 5 75	— —	— —
Old Comp'y's.	"	4 75 to 5 75	— —	— —
Cross Creek	"	4 75 to 5 75	— —	— —
Enterprise	"	— —	— —	— —
Girardville	"	— —	— —	— —
McMichael	"	— —	— —	— —
Shamokin	"	5 50	4 50	— —
Lykens Valley	"	— —	— —	— —
Broad Top	"	5 50	— —	— —
Hill & Harris	"	— —	4 50	— —
Henry Clay	"	— —	4 50	— —
Powelton	"	5 50	4 50	— —

Prices for Coal at Mauch Chunk.

	F. L.	Bro.	Gra.	Eg.	Sto.	Cst.
Lehigh	$3 50	$3 50	$3 50	$3 50	$4 00	$3 25
Wilkesbarre	3 50	3 50	3 50	3 50	4 00	3 25

For freight to Elizabethport and to New York see "Freights."

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein f.o.b. at Phila.	$5 00
Lemon " " "	4 75
Cumberland Vein Coal	5 00
Cumberland C. & I. Co.'s on board N. Y.	7 00
Maryland Coal Co. "	7 00
Consolidated Coal Co.'s "	7 00

*Dealers in these coals may be found in our advertising columns.

Company Coals.

	Le.	Str.	Gra.	Eg.	Sto.	Ches.
Scranton at E. Port	4 50	4 60	4 75	5 00	5 75	4 60
Pittston at Newburgh	4 50	4 80	4 90	5 00	5 45	4 70
Lackawana at Rondout	4 50	4 85	4 90	5 10	5 75	4 90
Wilk'b're at Hoboken	4 75	4 75	4 85	5 25	5 75	4 75
Old Co. Lehigh at Pt. Johnston	— —	— —	— —	— —	— —	— —
Lehigh at E. Port	5 50	5 25	5 25	5 25	5 75	4 75

For freights to different points, see "Freights."

Prices at Baltimore—May, 1870.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 30@5 50
Pittston and Plymouth, do	5 00@5 25
Shamokin Red or White Ash, do	5 50@6 00
Lykens Valley Red Ash, do	5 40@5 50
Zerba Valley	25 50@— —
By retail, all kinds per ton of 2240 lbs.	7 00@7 50
Georges Creek & Cumberland f. o. b. at Locust Point for cargoes	— — @— —
By retail, all kinds per ton of 2240 lbs.	7 00@7 50
Georges Creek & Cumberland f. o. b. for shipping	$4 55

Prices at Georget'n, D.C., & Alexandria, Va.

May, 1870.

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$— —@— —
Lykens Valley	— —@— —
Shamokin Red or White Ash	— —@— —
Trevorton and Zerba Valley	— —@— —

Prices of Gas Coals.

May, 1870.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr. 73 Pine st., N.Y.
Duty, $1 25, gold.

	Coarse.	Slack.
Block House	$1 75	@- 75
Gowrie	1 75	@- 75

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coal.
Picton	$2 25	@1 25
Sydney	2 25	@- 80
Lingan	1 75	@- 80
Little Glace Bay	1 75	@1 00
Caledonia	1 60	@- 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Coarse. Currency.	Slack. Currency.
Fairmount Gas Coal Co. of N. Y.	7 50	@- —
Despard Coal Co.	$7 50	@- —
Penn.	— —	@- —
Newburg Orrel Gas	— —	@- —
West Fairmount Gas Coal	— —	@8 00

AT PHILADELPHIA.

Powelton	$7 80

Prices of Foreign Coals.

May, 1870.

Duty $1 25 per ton

Corrected weekly by PARMELE BROS., No 22 Pine street, New York.

Liverpool Gas Caking	$ 8 00@— —
" " Cannel	10 00@12 00
" House "	13 50@15 50
" " Orrel	12 00@14 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" " Cannel, "	18 00@20 00

Per ton 2,000 lbs. delivered.

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Schuylkill Haven	$2 00
From Port Carbon, 8 cents per ton more.	
Less drawback of 80 cents on all Coal shipped east of New Brunswick and south of Cape Henry.	

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Easton	$ 81
C. R. R., N. J., Easton to Elizabethport	1 12
Shipping expenses at Elizabethport	25
Warfage	10
Total	$2 28

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Easton	$ 81
C. R. R., of N. J., Easton to Pt. Johnson	1 19
Shipping expenses	25
Warfage	10
Total	$2 35

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ 81
Morris & Essex R. R. Easton to Hoboken	1 19
Shipping expenses	25
Warfage	10
Total	$2 35

TO SOUTH AMBOY.

L. V. R. R.	81
B. & D. R. R. / Cam. & Am. R. R.	1 09
Shipping Expenses	25
Total	$2 15

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	95
C. RR. of N. J. Easton to Elizabethport	1 19
Shipping expenses	25
Wharfage	10
Total	$2 49

BY CANAL.

Via Schuylkill Canal.

TO PHILADELPHIA.

From Schuylkill Haven	$1 07
" Port Carbon	1 10
" Port Clinton	1 03

TO NEW YORK.

From Schuylkill Haven	$1 70

Via Lehigh Canal.

TO PHILADELPHIA.

Lehigh Canal	$0 70
Freight and towage	1 07
Total	$1 77

TO NEW YORK.

Lehigh Canal	$ 40
Morris " / Freight, / Towing	1 10
Total	$ 2,50

TO JERSEY CITY.

Lehigh Canal	$ 40
Morris " / Freight	2 00
	2 40
For re-shipment	2 50
Total	$

Via Delaware and Raritan Canal.

TO NEW YORK.

Lehigh Canal	$ 40
Delaware Division Canal	30
Delaware and Raritan Canal	35
Freight	1,25
Towage	20
Total	$ 2,50

TO NEW BRUNSWICK.

Lehigh Canal	$ 40
Delaware Division Canal	30
Delaware and Raritan Canal	35
Freight	1.05
Total	$ 2,10

For Re-shipment—30 extra for shipping, and 10 cents. drawback.

Freights.—MAY, 1870.

TO EASTERN PORTS.	From Philad'a.	From E. Port and Port Johnston.	From Newburg.	From Rondout.
	$	$	$	$
Amesbury	$2 75	— —		
Bangor	2 75	— —	1 75	
Bath	2 75	2 00	1 90	
Boston	2 50	1 53	1 80	1 75
Bridgeport	1 65	1 00	1 20	1 20
Bristol	2 00	1 40	1 45	
Cambridgeport	2 50	2 00	1 90	
Derby	2 00	— —		
Dighton	— —	— —	1 50	
East Cambridge	2 50	2 00	2 00	
Fall River	1 75	1 40	1 45	
Hackensack	1 95	1 50		
Hartford	2 75	1 35		
Jersey City	1 75	50		
Middletown	— —	1 25		
Mystic	2 00	1 25	1 35	
New Bedford	1 75	1 40		
Newburyport	2 00	2 00	1 90	
New Haven	1 70	1 00	1 20	1 20
New London	2 00	1 15	1 20	1 30
Newport	1 75	1 40	1 45	
New York	1 25	50	70	
Norwalk	1 75	1 00	1 15	
Norwich and tow	1 70	1 35	1 40	1 40
Pawtucket	1 90	1 50	1 65	
Portland	1 75	1 75		
Portsmouth, N. H.	2 25	2 15	1 90	1 85
Providence	1 75	1 40	1 50	1 45
Rockport	2 10	— —		
Saco	2 50	2 10		
Sag Harbor	2 00	1 40	1 35	
Salem	2 25	1 60	1 80	1 75
Stamford	2 00	1 00	1 10	
Stonington	2 00	1 30	1 30	
Taunton	2 75	2 00		
Warren	— —	1 40	1 50	
Washington	1 10			
TO RIVER PORTS.				
Albany		1 00	- 60	
Catskill		— —	- 50	
Cockackie		— —	- 50	
Coeyman's		— —	- 75	
Cold Spring		— —	- 35	
Fishkill		— —	- 30	
Haverstraw		50	- 60	
Hudson		— —	- 50	
New York		— —	- 70	
Nyack		50	- 60	
Poughkeepsie		— —	- 35	
Rhinebeck		— —	- 30	
Rondout		— —	— —	
Saugerties		— —	- 40	
Sing Sing		— —	- 75	
Stuyvesant		— —	- 55	
Tarrytown		— —	- 75	
Troy		1 00	- 75	
West Point		— —	- 35	
Yonkers		40	- 60	

Foreign and Provincial Freights.

May, 1870.

Foreign.
Newcastle and Ports on Tyne, per keel of 21 1-5 tons.....£13 10@£14 10
Liverpool.....12s.6d@14.ton

TO NEW YORK.

Provincial
Sidney.....$—
Lingan.....——
Cow Bay.....——
Port Caledonia.....——
Little Glace Bay.....——

TO BOSTON.

Sydney.....$—
Lingan.....——
Cow Bay.....——
Port Caledonia.....——
Little Glace Bay.....——

Towing Rates.

TO EASTERN PORTS.

	Per Ton.
To New Haven,	$ 40
Bridgeport,	40
Southport,	40
Westport,	40
Norwalk,	40
Stamford,	40
	Per Boat.
Greenwich,	$70 00
Port Chester,	80 00
Mamaroneck,	70 00
Glen Cove,	55 00
New Rochelle,	55 00
East Chester,	60 00
West Chester,	30 00
White Stone,	30 00
College Point,	25 00
West Farms,	25 00
Flushing,	30 00
Harlem and Mott Haven,	20 00
Port Morris,	20 00
Ninety-first street and Astoria,	16 00

Boats beyond Port Chester, with less than 200 tons, $80 per Boat.

TO RIVER PORTS.

Boats of 150—250 Tons.	Per Ton.
To Manhattanville,	8 cents
Spuyten Duyvil,	8 "
Yonkers,	9 "
Hastings,	10 "
Piermont,	17 "
Dobbs' Ferry,	12 "
Nyack,	14 "
Tarrytown,	15 "
Sing Sing,	16 "
Croton Landing,	17 "
Haverstraw,	17 "
Verplanck's,	17 "
Peekskill,	18 "
West Point,	20 "
Cold Spring,	20 "
Newburgh,	18 "
Poughkeepsie,	22 "
Rondout,	23 "
Boats of 100 Tons	*Per Boat.*
To Manhattanville, and Return,	$11 00
Spuyten Duyvil, "	13 00
Yonkers, "	15 00
Sing Sing, "	20 00
Peekskill, "	25 00

METALS.

NEW YORK May 20, 1870.

IRON.—Duty: Bars, 1 to 1¼ cents ₱ lb; Railroad, 70 cents ₱ 100 lbs.; Boiler and Plate, 1½ cents ₱ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ₱ lb; Pig, 9 ₱ ton; Polished Sheet, 3 cents ₱ lb.

	Store Prices.
Pig, Scotch No. 1, ₱ ton	31 50@37 00
Pig, American, No. 1	33 00@34 —
Pig, American, No. 2	31 —@32 —
Pig, American, Forge	29 —@30 —
Bar, Refined, English and American	— —@75 00
Bar, Swedes, assorted sizes (gold)	85 00@97 50
Bar, Swedes, ord'y sizes, less 5 ₱ ct.	115 —@125 —
Bar, Refined	77 50@ — —
Bar, Common " "	72 50@ — —
Scroll " "	87 50@115 —
Ovals and half-round " "	95 —@110 —
Band " "	95 —@ — —
Horse Shoe " "	95 —@ — —
Rods, ⅜ to 3-16 inch " "	85 —@121 —
Hoop " "	105 —@145 —
Nail rod, less 5 ₱ ct.	— 7 @—7¼
Sheet, Russia, as to Nos. (gold)	— 10½@—11—
Sheet, Single, D. and T Common	— 4¾@— 5¼
Sheet, Galv'd, Nos. 14 to 16 12 and 14 c. 25@30 ₱ c. off	
Rails, English (gold), ₱ ton	59 00 @60 00
Rails, American, at Works in Pa.	71 00 @72 00

STEEL.—Duty: Bars and ingots, valued at 7 cents ₱ lb or under, 2½ cents; over 7 cents and not above 11, 3 cents ₱ lb; over 11 cents, 2½ cents ₱ lb, and 10 ₱ cent ad val. (Store prices.)

English Cast (2d and 1st quality) ₱ lb	— 15	@— 18
English Spring (2d and 1st quality)	— 7	@— 10
English Blister (2d and 1st quality)	— 10	@— 17
English Machinery	— 11½	@— 14
English German (2d and 1st quality)	— 13	@— 15
American Blister "Black Diamond"	— —	@— 12
American, Cast, Tool do.	— —	@— 18
American, Spring, do.	— 9	@— 12
American Machinery, do.	— —	@— 12
American German, do.	— 10	@— 12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20 cents ₱ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₱ lb	— @— 31
Copper Bolts	— @— 31
Copper Braziers, 16oz. and over	— @— 31
Copper Nails	35 @— —
Copper, Old Sheathing, &c., clean	16 @— 17
Copper, Chili Pig	— @— —
Copper, American Ingot	18½@— 19½
Yellow Metal, New Sheating	24 @— —
Yellow Metal Bolts	24 @— —
Yellow Metal Nails	— @— 24

LEAD.—Duty: Pig, $2 ₱ 100 lbs.; old Lead, 1½ cents ₱ lb; Pipe and Sheet, 2½ cents ₱ lb.

Galena, ₱ 100 lbs	$— @— —
Spanish (gold)	6 20 @6 25
German, do.	6 20 @6 37½
English, do.	6 20 @6 62½
Bar (net)	— @ 7 70
Pipe and Sheet (net)	— @ 7 70

TIN.—Duty: Pig, Bars, and Blocks, 15 ₱ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₱ cent. ad val.

	Gold ₱ lb.
Banca	— @45
Straits	35 @——
English	— @35

PLATES.

Fair to Good Brands.	*Gold.*	*Currency.*
I. C. Charcoal, ₱ box	$8 50 @8 75	$10 00 @10 50
I. C. Coke	7 — @7 75	8 25 @ 9 25
Coke Terne	6 — @6 25	7 25 @ 7 50
Charcoal Terne	7 50@8 —	9 — @ 9 —

SPELTER.—Duty: In Pigs, Bars, and Plates, $1 50 ₱ 100 lb.

	Gold.
Plates, Foreign ₱ 100 lbs.	$6 00 @6 25
Plates, Domestic ₱ lb.	10 @— 11½

REMARKS.

IRON.—The demand for Scotch Pig is still moderate, but as there is very little coming forward, and the stock is light, prices are supported; the sales are 300 tons Eglinton at $34 50, ex ship, and 100 do. Gartsherrie, $36, from yard. American is inactive, and prices are not very firm; we quote, nominally, $33 @ $34 for No. 1; $31 @ $32 for No. 2; and $29 @ $30 for Grey Forge. There has been a little more inquiry for new Rails, and we notice sales of 1,500 tons 50-lb. English at $59 50, gold, and 500 do. old T, $45 50, currency. Bar continues depressed, and dull in all situations, and holders say there is no room for decline, nor any profit on the business done.

LEAD.—The demand for Pig is very light, and we hear of none but small jobbing sales; we quote ordinary Foreign at $6 20 @ $6 25, gold. Bar, Pipe and Sheet, $7 70 per 100 lbs., net cash.

COPPER.—New Sheathing remains steady at 31 cents, and Yellow Metal 24 cents, cash. The market for Ingot is still very quiet; the Lake companies are not offering their forthcoming supplies, and parcels on the spot are not pressed for sale. The Baltimore Copper Company have made a sale of 500,000 lbs. on private terms, and this has stiffened this description a little, 18¾ cents being now generally demanded. Lake is unchanged; 100,000 lbs. sold in lots at 19¼ cents.

TIN.—The market for Pig has become very quiet again, and the late extreme quotations are scarcely sustained; 100 slabs Straits sold at 34½ cents, 30 days, and some small lots 35 cents, cash, though the general asking price is 35 @ 35½ cents; English, nominally, 35 cents; and Banca 45 cents, though of the latter there is very little here, all gold. Plates are in but moderate demand, though prices remain steady; sales have been made of 300 bxs. ½d X and Extras, at the rate of $8 37½ for I.C.; some I. C. Coke, $7 25; 500 bxs. Charcoal Terne, $7 50, all gold; 400 do., 200 do. Charcoal Tin, and 600 do. I. C. Coke, on terms not made public.

SPELTER.—Foreign is neglected, and our quotation of 6 @ 6½ cents, gold, is quite nominal.

ZINC.—American Ox. Zinc, 6½ @ 7c.; French do., 9½ @ 10c.; Sheet Zinc, 9 @ 10c.

MANGANESE.—Lump, 4 @ 4½c.

Mining Stocks.

NEW YORK, May 19, 1870.

Mining stocks are checked in their downward course, and our quotations will not materially vary from our last. Large sales of Grass Valley are reported this P. M. at 21c., and Black Hawk Gold at 35c.

Petroleum stocks do not indicate much alteration from our last quotations. Home is quoted at $4 50, and Central at 65c. Below is the latest from the Stock Board:

	Bid.	*Asked.*
Bennehoff	52	—
Bergen Coal and Oil	40	—
Bliven Oil	40	1 00
Brevoort	1 00	—
Buchanan Farm	45	—
Central	60	65
Home Petroleum	4 50	—
N. Y. & Alleghany	1 75	—
Northern Light	50	70
Pithole Creek	1 40	—
Rathbone	30	—
Rynd Farm	32	40
Second National	—	75
Blood Farm	75	—
United Petroleum Farms	24	—
United States	75	80

San Francisco Stock Market.

A telegraphic despatch from the San Francisco Stock Board, dated May 17, reports Gould & Curry at $1 18, $1 31, $1 26; Yellow Jacket, $42; Kentuck, $60; Belcher, $19 50; and Amador $200. Without exception, all of the stocks are depressed in comparison with our last reports. Our quotations below exhibit the condition of the principal stocks:

SAN FRANCISCO, May 17, 1870.

	1st Board.	*2d Board.*
Savage	31	—
Crown Point	15½	—
Yellow Jacket	42	—
Kentucky	60	—
Chollar Potosi	—	23
Gould & Curry	1 18	1 26
Ophir	16	16½
Alpha	—	—
Belcher	19	—
Imperial	41	—
Hale & Norcross	—	—
Amador	200	—

The Slate Trade.

The market is still quiet, and very little doing. Prices are at "low water mark." Quotations are unchanged from last week.

PRICES OF ROOFING SLATE.

NEW YORK, May 21, 1870.

[Corrected weekly.]

(A "square" represents 100 superficial feet.)

Vermont purple, 1st quality, per square	$9 50@10 50
" green, 1st " "	9 50@10 50
" red, 1st " "	15 00@16 00
" variegated, "	8 5 @ 9 50
Pa. b'k and d'k blue, 1st qual., "	7 00@ 8 00

Shipments of Slate over the Lehigh Valley and Lehigh and Susquehanna R. R., and Lehigh Canal,

For the week ending May 14, 1870.

LEHIGH VALLEY R. R.

ROOFING SLATE.

Girard Slate Co.	175 squares.
Jones & Williams	140 "
Locke Slate Co.	105 "
Lehigh "	105 "
D. Thomas	70 "
Blue Vein Slate Co.	70 "
Kuntz & Woodring	70 "
Keystone Slate Co.	35 "
American "	35 "
Hope "	35 "
D. Williams & Co.	35 "
Jones & Town	35 "
Saylor & Morgan	35 "
Star Slate Co.	35 "
Total	980 "

MANTELS.

Lehigh Slate Co.	4 cases.

SCHOOL SLATES.

A. W. Leach	33 cases.
D. Williams	20 "

BLACK BOARDS.

Lehigh Slate Co.	1 case.

LEHIGH CANAL.

ROOFING SLATE.

Girard Slate Co.	340 squares.

LEHIGH AND SUSQUEHANNA R. R.

ROOFING SLATE.

New York & Pennsylvania Slate Co.	40 squares.
Thos. W. Parry	140 "
H. W. Harper	35 "
Eagle Slate Co.	35 "
National Slate Co.	35 "
Philadelphia Slate Co.	35 "
Total, L. and S. R. R. R.	320 "
Previously	332 "
Total, L. V. R. R.	980 "
Previously	1,920 "
Grand Total	3,552 "
Total for the week	1,300 "

SCHOOL SLATE.

A. W. Leach	34 cases.

The amount of Roofing Slate shipped over the Lehigh Valley R. R. during the years 1868 and 1869 was:

	CARS.	SQUARES.	LBS.
1868	1,000	40,000	20 000,000
1869	1,200	48,000	24.000,000

and the shipments of slate during 1870 will nearly double that of the preceding years.

Armor Plate Testing.

A NEW method of testing thick armor for her Majesty's ships has been introduced at Portsmouth, in the trial of two large plates for the "Glatton" and "Devastation" breastwork monitors. Hitherto, the practice has been to fire at the plate with spherical shot from the smooth bore 8-in. gun, but the method now brought into use by the Admiralty substitutes the 7-inch muzzle-loading rifled gun with chilled shot for the smooth bore. The powder charge varies according to the thickness of the plate under test in the following degrees: For 12-in. plates, 21 lbs.; for 11-in. plates, 18½ lbs.; for 10-in. plates, 16½ lbs.; for 9-in. plates, 14 lbs. The distance between the gun and the plate is 30 ft., and four shots are fired at the plate within an area of two square feet. The plate for the "Glatton" was from the rolling-mills of Messrs. CHARLES CAMMELL & Co., Cyclops Iron and Steel Works, Sheffield, measuring 10 ft. in length, 3 ft. 6 in. in breadth, 12 in. in thickness, and weighed 7 tons 2 cwt. The plate for the "Devastation" was from the rolling-mills of Messrs. JOHN BROWN & Co., Atlas Iron and Steel-works, Sheffield. Its dimensions were 14 ft. in length by 4 ft. 6 in. in width, and 10 in. in thickness, and weight 10 tons. The average penetration of the shots in the 12 in. plate was 7.2 in., and in the 10 in. plate the penetrations were 6.3, 6.8, 6.8, and 7.8 in. respectively. It is a remarkable feature in the manufacture of these enormous slabs of iron for our new turret ships that they are bent to the required form direct from the rolls, and when at cherry-red heat.—*Engineering.*

Mode of Nourishing the Street Trees in Paris.

ALL the boulevards of Paris are planted with trees, many of which were, however, destroyed during the Revolution of 1848. New trees were, therefore, planted, and their growth fostered with an amount of skilful attention that has produced astonishing results, when the natural disadvantages are taken into consideration. The trees are planted in loam that has been previously mixed with sand, and transported to the city. This is contained in large receptacles, lined with brick, sunk below the surface of the footway, and coated over with cement, so as to render them impervious. They form, in fact, gigantic water-pots; and into them are conducted the roof-drains of each house block, from which the earth derives its water supply. These basins or flower-pots are built of capacity sufficient to admit of considerable expansion on the part of the roots of the trees. An ornamental circular iron grating, set flush with the footway, is placed over these basins and around the trunks of the trees. This admits of air for the proper support of the roots. The roots of the trees are thus removed from the deleterious influences of escaping street gas and the poisonous emanations from sewers, causes which are well known to have destroyed the vegetation in the streets of many cities.

Metallurgy Outdone—Rich Yields from Poor Ore.

OF all the methods that have been tried in Colorado for extracting the precious metals from poor ores, the following, given by a correspondent of the Colorado *Herald*, is by far, in our opinion, the most successful. We have here indeed the greatest paying process of the age. Says the writer:—

"A new method to make poor ore pay has been discovered by me, by force of circumstances. It required neither years of study, nor expensive experiments. I propose, therefore, to give the method gratis. It is thus: Mine and raise not more than a load at each of several claims, then take a position in some shallow hole where you can watch your several piles; it won't be long before you see a quartz wagon (I have seen two this week) coming after your piles. Wait quietly until the teamster has loaded up, then walk up to him, and tell him his load is worth so much; that he must come down, or you would introduce him to the City Marshal. In this way I have made quartz pay fully 'seventy-five per cent.' By the way, as I am now writing on this subject, I want to use the *Herald* to advertise the man who took half a load from near the lake, north of it, on Wednesday last, about ten o'clock, and came near running over me when I was trying to save another pile which I thought he was after. This man will save expense by leaving fifteen dollars with the City Marshal. If he don't, I will describe the man and team in my next to the *Herald*. He is a very valuable man to his employers, who run a mill. I will endeavor to give a price current of quartz, with the names of those who are the purchasers, in my next communication.

"Yours, A ROBBED MINER."

Pacific Coast Pearl-Fishery.

It is a long time, says the San Francisco *Commercial Herald*, since we have heard much of the Lower California Co., which obtained from Mexico a tract of land comprising forty-six thousand eight hundred square miles in that peninsula: and we now learn that the company is actively engaged in preparing an extensive expedition with the view of settling two of its provinces with American emigrants, and establishing a large ocean city. It is claimed that the company is armed with powers equal to those enjoyed by the great East India Company, which founded an empire. Its Superintendent and Governor-General is the Hon. John A. Logan, who has declared his intention of visiting the province, and giving it close personal inspection during the recess of Congress. The President of the company, the head-quarters of which is at No. 35 William street, New York, is Richard Schell; Wm. R. Travers is the Treasurer. Following which, we find the names of Gen. B. F. Butler, August Belmont, Wm. G. Fargo, Caleb Cushing, C. K. Garrison, John A. Griswold, John Anderson, Robert P. Leese, Ben Holladay, Robert M. McLane, Francis Morris, John McB. Davidson, Leonard W. Jerome, S. L. M. Barlow, Edward S. Sanford, J. B. G. Isham and Marshall O. Roberts.

This much is prefatory to discussing the pearl-fisheries which exist in the Gulf of California. The Mexican revenue returns for 1869 show that the catch of pearls and pearl-shell along the gulf coast granted to the Lower California Company, amounted last year to the sum of $78,000. This is the value, as returned on the estimates made by the divers and speculators on the spot, but is clearly very short of the actual market value, which was probably four or five times the amount specified, and it is certain that not more than fifty per cent. of the whole catch is ever reported to the Government. The business is carried on in slip-shod, hap-hazard manner, which only excites astonishment that any returns at all are given. We have good reason to believe that the real value of the catch for 1869 was in the neighborhood of $300,000. But the business is attended with so many difficulties and obstacles that Americans soon get discouraged and abandon it. The divers are all Yacki Indians, in whom no confidence can be placed. They will contract to dive, but insist on a considerable advance, either in money or goods. After the advance has been made, the unlucky employer frequently finds himself some bright morning minus his divers, and is then compelled to go over the whole ground with a fresh set, only to be treated in like manner by the new comers. If well fed and well treated—things to which they are perfect strangers—they regard their employer as little better than a simpleton, laugh at his easy trust in human nature, and take themselves off without delay.

It frequently happens that Indians who are not divers offer themselves in that capacity, requiring the advance, and as the contractor cannot know the truth, he is often duped. The real divers know their value, and take every possible advantage. Under these, and other difficulties of a like nature, it is not singular that the pearl fishery of this coast has not attracted a larger share of attention; but if conducted with system, and supported by the exercise of proper authority, it would prove most lucrative.

Miscellanea.

Two car loads of silver ore from Little Cottonwood canon were shipped recently by the Utah Central district to Jersey City. This is the first ore from the Territory, and it is intended for a trial to find the best place to turn it into silver bullion. The expectation is (says a Salt Lake contemporary,) that when the roads are in a condition to permit of easy hauling, fifteen car loads a week will be shipped from the Cottonwood mines.

ACCORDING to the *Democrat*, a coal-bed four feet thick has been opened one mile north of Knob View, on the South Pacific Railroad, ninety-eight miles south-west from St. Louis. This coal was found only four feet below the surface. It will be developed and worked without delay. A discovery of coal at a depth of twenty-five feet, near Leesburg, on the same road, about eighty miles south-west from that city, is reported as made a few days since.

ACCORDING to the *Avalanche*, WELLS, FARGO & Co. shipped from Owyhee, during the year 1869, $835,181 07 worth of bullion, coin value. The total product of the mines of the district for 1869, our contemporary thinks, may safely be put down at a million of dollars in coin, as the aggregate carried away in private hands would easily bring it up to that amount. This, be it remembered, is from only two or three mines, and most of the time but two mills were in operation.

The Causes of Spontaneous Ignition of Coal.

MANY different theories have been put forth to explain the spontaneous ignition of coal, which happens so often, especially when coal is piled up in large masses. It has been attempted to attribute it to a decomposition of the coal similar to the decaying process of vegetable substances, like, for instance, that occurring with moist and tightly-packed hay—a decomposition which often produces combustible gases. Dr. E. RICHTERS, chemist of the mining school at Waldenburg, however, declares such a decomposition highly improbable. Coal is the product of a slow process of transformation of the ligneous fibres, under entire or partial exclusion of air. It is impossible to understand how this alteration should at once be carried to spontaneous ignition, when the coal comes in contact with air; but it is certain and susceptible of proof that in this case there is a slow oxidation of exactly those constituents of the coal, which could not have been formed but under the exclusion of air. The formation of easily-ignited gases, as a consequence of continual decomposition, does not take place in the air, neither at ordinary nor high temperature (about one hundred and ninety degrees centigrade), whether the coal be dry or moist. The immediate cause of spontaneous ignition is also frequently attributed to iron pyrites, which is never entirely wanting in any coal. According to RICHTERS, however, this influence is only of subordinate importance in most cases, because the coal richest in iron pyrites is by no means always most inclined to spontaneous combustion, and also because the amount of pyrites present is always too small to explain spontaneous combustion by its decomposition, even under the most favorable circumstances.

Let us suppose, for instance, that a certain kind of coal contains one per cent. of iron pyrites; if this should suddenly be decomposed under circumstances prohibiting all loss of heat, the temperatare of the coal would be raised seventy-two degrees C. But the oxidation of iron pyrites never takes place under circumstances so favorable as those here assumed. It always requires a long time, and is frequently not ended after the coal has been exposed for years. Of course, the slower the process, the less is the increase of temperature, because, under otherwise similar circumstances, the loss of heat by conduction, radiation, evaporation, etc., is proportionate to the time. RICHTERS attributes the spontaneous ignition of coal to another cause. All coals absorb oxygen, though with different intensity. This absorption is the first source of the generation of heat; but, like that caused by the oxidation of iron pyrites, it is not sufficient for combustion. But the remarkable and very important difference exists in this case, that the heat is developed in a much shorter time, and that it exerts therefore a more effective influence towards raising the temperature than when iron pyrites is oxidized in a proportionally long time. RICHTERS found, for instance, that coarse coal-dust absorbed in twelve days from one and a quarter to three times its own volume of oxygen; and he assumes, according to an approximate calculation, that the temperature of the coal, which took up the most oxygen, may have been about eighty-three degrees C. As soon as the temperature has been raised by absorption to a certain degree, a strong chemical reaction of the oxygen on the ignitable portion of the coal is inaugurated. This reaction is, on one hand, a new source of the development of heat, while, on the other hand, it is itself increased continually with the increasing temperature. According to RICHTERS' experiments, three different kinds of coal lost, by a continual heating to from seventy to eighty degrees C, during a fortnight, as high as 3.6 per cent. of their heating power. The same effect can be reached, if the coal is heated during three or four days only to one hundred and five degrees; and the same alterations take place in a few hours, if the temperature is raised to one hundred and fifty degrees. For one of the coals experimented upon, for instance, the heat lost, during a fortnight's exposure to the above test, is calculated to be equal to two hundred and eighty-six units per pound of coal; if these had served only to heat the coal, its temperature would have been raised one thousand one hundred degrees, or, in other words, the coal would have been heated to far above its point of ignition, and consequently, would, have been burnt. Absorption must here be kept separate from oxidation proper; the first, as the nearest cause of the solution of heat, to a certain degree introduces the process; and only when the temperature is raised sufficiently, does oxidation of the coal take place with increasing rapidity, until ignition follows; all conditions, which favor the absorption and necessary supply of oxygen, but act against a diffusion of heat, must consequently enhance the temperature, which will ultimately be increased to ignition. Of high importance in this connection are:

1. The attraction of oxygen by the surface of the coal. The greater this surface the more rapidly, under the same conditions, does the rise of the temperature take place. If the surface is very small, it is possible that the loss of heat, during a certain time, will equal the amount of heat set free, in which case the temperature will not be raised. The essential condition for a subsequent rapid oxidation is, therefore, in such a case, wanting.

2. Breaking coal into small pieces, which affects, indirectly, the absorption of oxygen, is next to be considered. Small pieces, offering a greater surface to the air, and hence absorbing oxygen faster, become more intensely heated than larger pieces. The structure of the coal is also of importance in this connection, since the more porous and fibrous varieties absorb oxygen faster than dense pieces of the same size.

3. When coal is not stored in large heaps, the heat generated is not radiated, and is not likely to raise the temperature to any great extent.

4. All conditions which tend to the replacement of the oxygen consumed are of inherent importance. In many districts it is common to leave canals of from three-quarters of a foot to one foot diameter, constructed of loosely-jointed plank, through the dumps. These canals can only serve to allow the heat to escape, by virtually dividing large dumps into smaller ones. But, on the other hand, owing to their usual imperfect construction, they are decidedly injurious.

Every miner, who handles easily-ignited coal, knows that combustion first takes place where the dry coal is exposed to a draught of fresh air, which supplies the place of air, from which the oxygen has already been taken up.

These canals can only answer a good purpose when they are entirely air-tight, and pass through the dumps either from side to side, or from top to bottom. Whenever, on account of imperfect construction or improper arrangement, they allow a changing of the air in the centre of the dump, they positively increase the danger.

At all events, the spontaneous ignition of coal can be much better prevented by packing the dump as closely as possible, and entirely rejecting these canals, than by using them as they are now made.

Dampness may sometimes assist and sometimes hinder the ignition. When the coal contains much pyrites (which is only decomposed in the presence of water), and has, in other respects, but little absorbtive tendency, it is quite possible that the heat generated by the oxidation of the pyrites, might be greater than that produced by the absorption of oxygen by the coal. Such a coal would decompose faster and would be more likely to ignite spontaneously, in a moist than in a dry condition.

If, on the contrary, the proportion of pyrites is small, and the absorptive tendency of the coal itself greater, spontaneous ignition would take place sooner, because the absorption of oxygen would be more considerable in a dry than in a wet state.—*Deutsche Industrie-Zeitung.*

A Chapter from Practice in Colorado.

THE owners of a certain gold mine in Colorado forward to us the following statistics of their operations during the closing quarter of 1869, desiring, at the same time, to withhold from publication the name of the enterprise:

QUANTITY OF ORE RAISED.

Treated in stamp-mill	850,00	tons.
" " smelting-works	13,27	"
Total	863,27	tons.

AVERAGE ASSAY VALUES—COIN.

Of mill ore, per ton, gold	$25,13	
" " " silver	1,94	
		$27,07
Of smelters' ore, per ton, gold	131,21	
" " " silver	16,22	
		$147,43
Of all ore raised		28,92

AVERAGE COST PER TON—CURRENCY.

All expenses except dead-work	$13 59
Dead-work	2,08
Total	$15,67

AVERAGE YIELD PER TON—CURRENCY.

Of mill ore	$12,68
Of smelters' ore	110,07
Of all ore raised	14,17

PERCENTAGE OF ASSAY OBTAINED.
(Gold being reckoned at 120.)

Of mill ore	40 per cent.
Of smelters' ore	62 "

These figures indicate a net loss of $1 50 currency per ton of ore raised. If the accounts from which the above statement was condensed are full and trustworthy, this loss is all that the owners have to sustain on the quarter's operations; and certainly it is not large enough to be discouraging. A slight improvement in the quality of the ore, or in the perfection of treatment, or in the economy of working and administration, would cover this trifling deficit. Still, it is much pleasanter to be earning a small profit than to be called upon to face a small loss; and we do not doubt that the parties in question have resolved to persevere until the balance, now almost even, shall incline to the other side.

The statement we have published is, of course, deprived of much of its value to the general reader by the suppression of names; but it will serve us just as well for a text, on which to base a few suggestions and inquiries. For the sake of these comments, we assume (what we do not know) that the present form of the statistics sent us indicates the manner in which they were made up; and we remark:

I. These figures seem to be drawn from books kept by the ordinary mercantile method. The averages are apparently obtained by dividing the expenditures by the number of tons produced. But this method of keeping mining accounts, while it permits a balance-sheet to be drawn and the financial condition of the enterprise to be ascertained at any given time, does not give opportunity for intelligent scrutiny of the details of the management. The separation of dead-work from other expenses is proper; but the separation of a good many other items would be equally proper. Thus, for instance, it is highly important to know how much of the $13 59, called "expense per ton," is due to mining labor underground, how much to pumping and hoisting, how much to surface transportation, how much to salaries at the works, and how much to salaries elsewhere. This is important, because some one of these departments may be capable of reform or retrenchment, and without such analysis it is impossible to find out which it is. Moreover, some of these expenses are constant and others are variable. Hence, the lumping of them all together prevents intelligent calculation as to the effect of proposed changes in operations. For instance, it is quite probable that the whole loss of the mine now under comment is exceeded by the salaries of the officers for the period in question. If that is the case, a simple enlargement of the scale of operations would tend to remove the deficit. But all the elements necessary for the determination of such questions should be furnished by the assorted accounts of the mine and mill.

II. In addition to the detailed and analytical record of expenses, upon which we have insisted, it is necessary also to know the condition of the mine at the beginning and at the close of any given period, in order to decide what has been the success of operations during that period. Thus we are told in the statement before us, that $2 08 of dead-work have been performed for every ton of ore extracted. But it is necessary to know whether this amount of dead-work was adequate to the maintenance of proper reserves. If it was principally drifting in good ground, and with a reasonable distance between levels (sixty feet, at least,) it is possible that the eight hundred and sixty-three tons removed have been replaced as it were with an equal quantit y exposed and made accessible by stoping. But the danger is always, that the reserves will be allowed to decline, especially when the mine is running a little behind hand.

III. It is always difficult to decide what part of the dead-work of a mine shall be charged to construction account, and what to running expense. But there is an analogous difficulty in every business. The merchant expends large amounts in fitting up his store and in advertising his goods, to begin with; and he does not always expect this expenditure to be covered by the profits of the first year; but after he has established himself, he will consider any year an unprofitable one, in which the gains of his business are not sufficient to pay for rent, repairs and advertising. The dead-work of mining is exactly similar, with this exception, that it is absolutely without value, beyond the enterprise immediately concerned. When a mine is exhausted and abandoned, the second-hand shafts and tunnels are not available assets. Though they may have cost a hundred dollars a yard, they cannot be sold at sixpence a league. Hence the whole amount thus expended must be repaid during the life of the mine out of the profits of the mine. The working capital and the cost of the property must be transformed into a terminable annuity, and extinguished by the annual payments. The ordinary and useful dead-work, after the mine is once opened, should be considered a part of the running expense, as also the repairs, etc. But this item should be always kept separate in the accounts, in order that it may be properly estimated and controlled; and in order, also, that in any emergency, the owner may be able to calculate exactly how much he can realize out of the mine by suspending all dead-work, and extracting all the valuable material in the reserves. This profit in sight is one of the quantities in the equation by which the the value of the mine is to be determined. It is itself the minimum value of the mine.

IV. If the quantity and value of the ore in sight in any given mine is known, it is of course easy to say that the mine is doubtless worth the profit to be obtained from this known amount. The risks of realizing that profit are, on the whole, not greater than those of any other business. But the estimation of the probable life of a mine—that is, of the probable duration of profitable working—is a matter of profound difficulty. If this element of calculation were only given, we could calculate the present value of the mine. It would be the sum, which placed at compound interest for the term of years of the life of the mine, would amount to the sum of the amounts of all the annual dividends drawing compound interest during the same period. Thus, if the life of a mine is ten years, its dividends must be fifteen per cent. annually; and it is worth the sum on which it is paying fifteen per cent. This is on the basis of compound interest at seven per cent. The problem, it will be seen, is much like that of life insurance; and we shall take another occasion to inquire into its fundamental element—the life of a mine, and the means of determining it.

Artificial Light.

WHEN the products of the distillation of coal were first proposed for purposes of illumination, the person who advocated it was set down as demented; nevertheless he carried his point, and those who opposed him proved to be the only crazy persons involved in the transaction. The light provided in this way is often of an inferior quality, and it has been proposed to add to its value by passing it through some volatile liquid near the point of consumption. The hydrogen of the gas takes up carbon and burns with a brighter flame. Recent experiments have been tried with other liquids than those popularly known, and the results have been so satisfactory that hopes are entertained of being able to employ some of the new mixtures for photographic purposes. If we pass hydrogen through zinc ethyl, it takes up a quantity of zinc mechanically and burns with a brilliant flame. If chloro-chromic acid be substituted for the zinc ethyl, some chromium is carried off with the hydrogen and the light is more brilliant than before, and is said to have powerful actinic properties. Chloride of titanium also produces fine effects, and if the research were to be continued, other liquid compounds of the metals would be found to yield similar results. The chlorides of silicon and of iron ought to be tried. The results obtained appear to confirm the theory that the light comes from a solid incandescent substance in the flame, and hence a metal can be advantageously substituted for the carbon commonly employed.—*Journal of Applied Chemistry.*

Adulteration of Soda.

COMMERCIAL soda (the carbonate) is very frequently adulterated with sulphate of soda. As a quick means of detecting this, HAGER recommends a solution of one to two parts of chloride of mercury in one hundred parts of alcohol of 80 per cent. Small pieces of the soda are spread over the bottom of a porcelain vessel, so that they do not touch each other, and the solution of sublimate is poured over them. In a few seconds, the soda crystals are colored reddish brown, while the sulphate of soda remains colorless. The solution is not colored by the process in the least, and can be used over and over again. The only objection to this really convenient test is the fact that the sublimate used is extremely poisonous; but mistakes may be easily prevented by giving the solution a distinct scent by the addition of a little benzol or turpentine.

THE ENGINEERING AND MINING JOURNAL.

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ROSSITER W. RAYMOND, Ph. D., Editor,

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The Accident Upon the Elevated Railroad.

THE Elevated Railroad being very nearly ready to open for passenger traffic, it became necessary, in the opinion of the engineer, to test the road by subjecting it to a greater weight and strain than could possibly come upon it in actual use. For this purpose a platform-car was built and twenty thousand pounds of pig-iron placed upon it. This was then drawn by horses over the whole length of the road. By means of this test several flaws in iron stays, etc., were discovered and repaired by the insertion of sound bars in the place of those removed. The road, having stood this trial, was deemed secure; but for the perfect satisfaction of all concerned, it was resolved to run this loaded car over the track at the same rate of speed as that of passenger cars. The platform-car was attached to a passenger-car, and at 4 P. M. on Monday, the 16th inst., the train started, the total weight being about forty thousand pounds. There were some fifteen persons on board, comprising *only* those connected with the road. The cars proceeded as usual until the curve at the junction of Houston and Greenwich streets was reached. Here the cars are disconnected from one rope, run by their momentum around the curve, and connected beyond with the rope that drives them over the next section. The passenger-car had safely crossed the long span and just made connection with the wire-rope, and the platform-car was near the middle of the street, both cars moving at nearly ten miles per hour, when one of the posts gave way, and the platform-car slid off into the street, taking about one hundred and fifty feet of the track with it, and dragging the passenger-car backwards to the ground. The rope, firmly attached to the latter, held it until it was nearly half-way down, and then parted. There were a good many bruises and slight injuries, but no very serious damage was done to persons. The passenger-car clung to the rails until it reached the ground, and landed right side up.

We have carefully investigated the accident and its causes, and we fail to see in it such a catastrophe as some of the gentlemen of the press would fain have us believe. The weight had already been drawn over the road once, the points of strain had been carefully observed, and it was supposed that the track and its supports were amply strong; otherwise the trial would have been made in the evening, or at some time when the streets are empty. The cause of the accident was the unusual side-thrust of the heavy car moving round the curve at high speed. This cramped one of the arms of the pillar and allowed the track to slide off to one side. There were no persons on the train except those connected with the road, and all who were on board were there voluntarily. We think the company deserving of praise rather than blame for the care with which their preliminary trial was made. The road will not be opened to the public until it can safely bear the strain of twenty thousand pounds of iron on a platform-car running at the same speed as the passenger-cars. This gives a strain some three times greater than that of a passenger-car packed to its utmost capacity; and this, we think, should satisfy the most timid.

It remains to be said that these trials with heavy loads should be frequently repeated at intervals, in order to make sure that the peculiar vibration given to the iron in this position does not alter its texture. But the amount of the load employed has certainly been put high enough. When a test is sufficiently severe to insure an ample margin of safety, all further strain is likely to be injurious.

Of course, an elevated railway on single posts is not a desirable form, if the locality permits the use of double supports. But this has been excluded from the possibilities of the Greenwich street road by the exigencies of space. We confess that we do not know how the track as now constructed will wear, nor do we commit ourselves in favor of the enterprise, further than to say that the accident of Monday need not be accepted as good reason for apprehension. The weak points indicated will be strengthened with new and different constructions, and the behavior of the road under trial will be closely watched by the proprietors, as it will be watched also by the engineering world and the public.

The Metropolitan Fire Department.

WE publish this week an extract from the last annual Report of the old Metropolitan Fire Department, referring to the storage and use of dangerous combustibles. The whole Report is one of great interest; and particularly valuable is the careful record of operations for each month, giving, with regard to every fire that occurred, the date, signal, locality, time, and source of the alarm; height, material, and size of the building; occupants and purpose of occupancy; origin, extent, and cause of fire; the company first on the spot; the engine first throwing water on the fire; the commander of the force engaged; the companies at work; the duration of the fire; the extent of damage and estimated loss; the number of true and false alarms, and of fires extinguished without giving the alarm, and the manner in which such fires were extinguished, whether by officers, companies, individual members, police, or citizens.

The following interesting statistics are condensed from the extended monthly reports.

LOSSES BY FIRE FOR THE YEARS ENDING NOVEMBER 30, 1866, 1867, 1868, AND 1869.

Year.	No. Fires	Loss.	Less than 1866.	Less than 1867.	Less than 1868.
1866	796	$6,428,000	.....	.....	.....
1867	873	5,711,000	$717,000	.....	.....
1868	740	4,342,371	2,085,629	$1,368,629	.....
1869	850	2,626,393	3,801,607	3,084,607	$1,715,978

Total number of fires	850
Confined to one building	807
Extended to others	43
Estimated loss	$2,626,393
HOW DISCOVERED.	
Fire patrol	290
Police patrol	163
Bell ringers	115
Citizens	282
ALARMS.	
Telegraph—Fires	554
" False	100
Still	296
Total	950
BUILDINGS.	
Slightly damaged	784
Considerably damaged	89
Totally destroyed	49
EXTINGUISHED WITHOUT SENDING ALARMS.	
By officers	7
" companies	223
" individual members	54
" police	4
" citizens	8
Total	296

This record is a triumphant vindication of the policy of a paid Fire Department, and of the constantly improving management of this one. We have every reason to be sure that its honorable fame will be enhanced by the body which have recently, under the new charter of the city, assumed its direction.

It may be presumed that our city readers are familiar with the names of the gentlemen who constitute the present Board of Fire Commissioners, namely, Messrs. WILLIAM HITCHMAN, JAMES VENNESSEY, JOHN J. BLAIR, JAMES GALWAY, and General ALEXANDER SHALER—the two last-named being members of the old Metropolitan Board of Fire Commissioners. All these gentlemen are fully able to discharge, with honor to the city and credit to themselves, the Commission duties entrusted to their supervision and judgment.

Without detracting from the great credit due to our old Board, we may safely say that the present Commissioners are proved by their past history to possess the acquirements of thought, discipline, financial and mechanical ability—three most essential requisites for the executive administration of a department of this kind, on which our city's wealth is so directly dependent.

Mr. WILLIAM HITCHMAN, a graduate of the New York College, formerly Secretary to the Board of Education, and Speaker of the New York State Assembly two terms, is now President of the Commission; and Mr. JAMES HENNESSEY, of the firm of HENNESSEY & BROTHER, No. 33 Walker street, is the Treasurer. Mr. JAMES GALWAY, formerly Treasurer of the old Board of Fire Commissioners; and the remaining members of the present Board of Commissioners are, as will be seen from their past and present vocations, men of discretion and financial ability.

Major-General ALEXANDER SHALER, commander of the First Division of the National Guard, is known as a strict disciplinarian, and will not fail to use his power in maintaining thorough discipline and order throughout the Department. This tends to create and to perpetuate harmonious feeling and respect among the men, and between them and their officers, as was sufficiently demonstrated by the administration of General SHALER during his term as President of the old Board. Mr. JOHN J. BLAIR, who was a member of Assembly last term, is a gentleman of sound principle and judgment, and also a skillful, thorough mechanic. It is only a few years since he was one of the first heads of the Novelty Iron-works, where he had previously served his apprenticeship as a machinist. His knowledge in this sphere will be greatly useful to the Department.

But the ability of the Commissioners will lie as much in their choice of subordinates as in any accomplishments of their own. And in this connection we take pleasure in bearing witness that, so far as we are aware, a wise discrimination has been shown in the selection of competent officers and men. We may refer particularly to the engineers of steamers, who are required not only to be men of practical experience, but to familiarize themselves throughly in detail with each class of engines in the Department. Much credit is due Mr. J. L. PERLEY, Chief of the Department, for the manner in which the advancement of scientific knowledge is promoted among the officers and men under his supervision. Certain days have been instituted for the so-called "school," for instructions, explanations and discussions of fire duty, buildings, building materials, etc., together with other beneficial studies.

These classes were inaugurated by resolution of the Board of Commissioners, on the 10th of November last, as follows:

"*Resolved*, That classes for the instruction of officers of this Department in their various duties, be formed under the direction of the President of the Board, and that officers of all grades be required to attend when directed, unless prevented by sickness or the performance of fire duty."

The *Fireman's Journal*, of December 18, 1869, speaks of the classes as follows:

"It is worthy of notice that the meetings of the classes have been steadily and profitably maintained, and that the President of the Board, General SHALER, has almost always been present at every meeting of every class. He has organized the forms of instruction, which embrace a regular course of mechanics, hydraulics, the construction of steam fire engines and fire apparatus, the management of fires, and collateral subjects bearing upon the duties of the officers of the Department, and it is a matter of no surprise that great improvement has been obtained in the practical working of the force, when such wise means are adopted to instruct officers in those branches of education which are only equalled in importance to an intelligent performance of their charge by the manner in which they are generally neglected.

"Length of years of fire service, coupled with a certain amount of personal geniality or shrewdness, has generally been considered an all-sufficient title for command in fire departments, and, given these, a man's other qualifications or attainments have not been deemed a matter of importance. So that a man had experience in *using* fire apparatus, it has been esteemed unnecesseary for him to understand the construction of it, or to know familiarly and well the laws which govern the machinery, as well as the element which it employs against that other element which it is constructed to subvert.

"This low standard of intelligence, which would not be tolerated in any other pursuit, has been allowed to control the fire service of our country, and it is no wonder that the social standing of firemen, as a body, should have been so little in accord with the important interest which they are organized to serve.

"To General SHALER is due the gratitude of firemen everywhere, for inaugurating a change for the better, and for the energy he has manifested in carrying his plans into effect. Such a school of instruction should be regarded as essential in every department, and if firemen would elevate their organization to the dignity which some are disposed to claim for it, they must not neglect a matter so obviously to their advantage, and to the advantage of the property they guard.

"No claim for toleration on the score of experience alone can stand for a moment in the light of this age of intelligent investigation. Experience is valuable, but education is more valuable, and of the many claims for honor which General SHALER has earned from firemen, few, if any, are more to be esteemed than his action in organizing these classes of instruction."

Nor is this all; to enable each and every engineer to become fully acquainted with the construction and location of the different parts, water-lines, etc., of each and every engine, Mr. PERLEY has selected Mr. WILLIAM A. PITT, an engineer of steamers, to make drawings of all boilers of engines in the Department. These have been executed in half geometrical and half perspective design, upon a scale of one-fourth. This measure we consider one of great utility, as it at once shows to any new engineer appointed the construction of the boiler in his charge, and enables him to understand more readily its requirements.

The fact that the Department can find at once in its own working corps mechanical engineers like Mr. PITT, of education and skill, competent to the execution of any labor of this sort, required for the benefit of the organization, is creditable to the management, and constitutes a significant testimonial to the high character of the *personnel* they have secured.

California Tin.

THE *Scientific Press* of San Francisco says: "The first bar of California tin has been presented to the Society of Pioneers. It is eight inches long, four inches wide, and two inches thick; contains, by assay, 97.09 per cent. metallic tin, with some tungsten and traces of antimony, arsenic, sulphur and iron. On one side, there is engraved the following inscription: 'First bar of tin ever produced in the United States from native ore; taken from the San Jacinto Tin Mine, San Bernardino county, California. Presented to the Society of California Pioneers, by O. P. SUTTON, April, 1880.'"

This is not "the first bar of tin ever produced in the United States from native ore." More than ten years ago, the Temescal mines, in the same neighborhood as the San Jacinto, furnished a number of tons of very rich tin ore, which was reduced in this country and England. We have now in our possession some of the experimental bars from this ore, produced, we believe, in this city, by the late Dr. JUSTUS ADELBERG.

THE report of the meeting of the Polytechnic Club of the American Institution was unavoidably crowded out this week.

The Stanislaus (California) Silver Mines.

FROM the Tuolumne City *News* we learn the following particulars concerning the recent discovery of the lost silver mine in

Stanislaus county, although nothing establishing the richness of the mine is known beyond the general belief that it is the mine about which legend and story has told so much during the past twenty-five years. That was rich beyond anything discovered by the white man, and there are undisputed evidences about this discovery that the mine has been worked many years before the acquisition of California by the United States. The mine is situated in what we will call a slide in the mountain, which has left bare the various formations of rock. The old shafts are sunk in a row on a vein of what we shall term blue quartz, intermixed with mica and slate, in many places partaking of the nature of serpentine rock. The various sulphurets and pyrites of iron predominate to a great extent among all the rocks, and in several instances we noticed traces of the carbonate of copper. In the absence of any well-defined foot or hanging wall, we are at a loss whether to determine it a lode or a chimney, or mass, or mountain, if you please, of this kind of rock. Let this be as it may, if it is silver ore, there is sufficient quantity of it for all purposes. The old shaft, now being cleaned out, contains timbers over a foot in diameter, the length of which is not yet ascertained. These timbers are of the common nut pine, which usually decays quite rapidly. Close around the mine several trees have been cut. The scarf on the stump, while not smooth, such as the American would make, is yet much better than the general run of California Mexicans are in the habit of leaving. There are also remnants of an old hair rope, an oaken bucket, the staves of which are decayed and the hoops of which are rusted. We found also the handle of a pick, or some implement which is made of the common live oak of the country, and is in a decayed condition. As we said before, the amount of work done is considerable, but until the old shafts are cleaned out, no estimate can be formed of the exact character or what it was done for.

The Discovery of Springs.

By JULIEN THOULET, M. E., Wilkesbarre, Pa.

III.

A TERRAIN is favorable to the discovery of springs, when it offers the two following conditions: a permeable stratum sufficiently thick on the surface, and below it an impermeable stratum inclined at a proper angle. The boring of artesian wells has taught us that new springs may be expected at different depths as often as this alternation of the strata is repeated. As more rain falls on mountains than in valleys, a hilly country is the most favorable for the formation of springs; and the same is true of any place covered by trees, the shadows of which prevent excessive evaporation and permit the water to strain through the ground. This gives us the reason why the falling of forests is so detrimental in this respect to agriculture.

In primitive rocks, which present numerous cracks, springs are very numerous, but their size is moderate; in transition rocks, such as red sandstone, carboniferous sandstone, argillaceous slates, marble, bituminous limestone, which are more or less permeable and permit the water to percolate, springs appear generally towards the contact-lines between these rocks and the underlying primitive formation. In secondary rocks, springs are less numerous and larger. It is a maxim constantly in use in hydroscopy and perfectly verified by experiments, that the rarer the visible springs, the more water they carry. The most abundant springs issue from secondary rocks, and we can consequently hope to discover the most useful in those strata.

Among the most favorable rocks, the oolitic, compact, saccharoidal, siliceous, shelly and marly limestones deserve special mention. The unfavorable rocks are the cavernous, cellular and dolomitic limestones, and especially the volcanic rocks including ashes and sands, basalts, trachytes, etc. Among the deposits requiring the greatest skill and sagacity of the engineer, are clay, which is very unfavorable on account of its impermeability; chalk, the excessive porosity of which produces abundant but very deep-lying springs; marl, the nature and action of which are exceedingly variable, and the diluvium, which is generally too porous and disintegrated to hold water. Some rocks are favorable to springs as far as their composition is concerned, but it is unnecessary to prospect for water in them on account of the disposition of their strata. They are:

1. The un-stratified rocks intersected by vertical or nearly vertical crevices.

2. All the stratified rocks, the strata of which stand on their edges, and have a slope greater than 45°.

The subject treated in this article is susceptible of much more elaborate development, but we prefer to close it by merely giving some principles relating to springs, without entering into explanations or examples in illustration of those set forth, the full discussion of which would oblige us to go beyond the limits of a mere sketch. Mineral springs containing salt, gypsum, sulphur, iron, etc., follow in their subterranean courses the same laws as ordinary springs, and are discovered in a similar manner. Some springs are at first very slow to gather water at the bottom of a well, especially if the well has been bored during the summer; but during the winter, after heavy rains, the abundance of water enlarges the channels, and thenceforward the product increases for several years. Sometimes, though the operations have been carried on with all the required precautions, an accidental irregularity of the strata, impossible to be foreseen, prevents the discovery of the spring. Thus a bank of rock situated in the centre of the valley may obstruct a spring, and oblige it to make a circuit in order to overcome the obstacle. In this case the water runs away from its legitimate line for a short distance, but returns to it below. The disturbances caused by workings executed by man near the upper portion of the course, accidental crevices produced by earthquakes, obstruction of the channel by mud and sand carried along, which dam the water and may cause it to flow back—all these work to defeat the exertions of the hydroscopists in many cases.

The First Identification of Phosphorus in Iron.

Translated from WEDDING'S Metallurgy of Iron, by W. P. WARD.

IN 1781, MEYER published the results of a research concerning a "white earth" which he had discovered in a cast-iron made from "bog ore." He found that from the solution of this iron in dilute sulphuric acid, a white precipitate was deposited, which was the "earth" in question. Heating this substance by itself in a crucible, made of a piece of charcoal, he obtained a remarkably beautiful button, hollow and containing metallic columnar crystals. The metal was exceedingly brittle, easy to reduce in a mortar to a powder, easily smelted, and not magnetic.

He then made a great many different experiments with this substance. For example, he smelted it with twice its weight of lead, and obtained a very irregular button, which was somewhat malleable, could be cut slightly with a knife, presented a granular fracture and yielded before the blow-pipe a semi-vitrious slag and a smaller metallic button, which was attracted by a magnet. MEYER concluded from his experiments that he had discovered "the metal, or, more properly, the half-metal, which causes iron made from bog ore to smelt so easily."

In 1782 he published a new series of experiments upon this probable metal and proposed for it the name water-iron or hydrosiderum. At the same time, he gave a summary sketch of its characteristics, which leave no doubt that it was a phosphuret of iron. Its specific gravity was 6.71. It dissolved very slowly in the three mineral acids, but quickly (?) in fuming sulphuric acid and produced crystals with this as well as with chlorohydric acid.

In 1784, MEYER gave notice that his metal was only phosphorus with iron. He begins this notice with the acknowledgment that "mistakes in chemistry are, alas! too easy;" and closes with the expression of an unmistakable complacent self-consolation that, at all events, BERGMANN fell into the same error. In the complete works of the latter celebrated Swedish chemist, which appeared in 1783, there is a chapter on the "causes of cold-shortness" in iron, which contains the following points of interest: A "white lime" (the well-known old expression for oxides and similar compounds) was slowly deposited from the filtered solution of iron made from bog ore. This "lime," heated with charcoal, gave a semi-metal, etc., showing the same properties as those described by MEYER. BERGMANN regarded it as a new metal, and proposed the name siderum. It is remarkable that the German and the Swede conceived the same idea of the cause of "cold-shortness" at the same time, and both proposed the same name for the apparently new metal to which they attributed it.

Proposed Railroad Through Mexico.

A GENTLEMAN, just returned from Mexico, furnishes the following detail of the history, progress and prospects of a projected railway from the City of Mexico to the Pacific:

On August 26, 1859, Governor Antonio Ochoa, of the State of Chihuahua, granted to Sen. Angel Triaz, representative of the American and Mexican Railroad and Telegraph Company, the right of constructing a railroad and telegraph line through the State from the Rio Grande west to such point as might be chosen by the engineer of said company. On March 15, 1861, Governor Ignatio Pesquiera, of the State of Chihuahua, granted to Sen. Triaz., as representative of the company, similar privileges in that State, and on April 15, 1865, Benito Juarez, President of the Mexican Republic, issued a decree authorizing the company to build and construct a railroad from the Rio Grande to Guaymas or to some point on the Gulf of California, as should be chosen by the company. The American and Mexican Railroad and Telegraph Company for building a railroad and establishing telegraph lines through the States of Chihuahua and Sonora was incoporated in the city of New York, April 29, 1863.

In the winter of 1866, the engineer of the company arrived in Guaymas, Mexico, for the purpose of surveying and locating the proposed route. His surveys were extended as far as Santa Cruz, Sonora; at this point, owing to the depredations of the Apaches, and the conflicts between the French and the Liberalists, he was obliged to suspend the operations in the field and return to New York. By the terms of the concession from the Mexican Government the surveys were to be finished at a stipulated time. The Government ignored the facts brought forward in explanation, and in the defense of their bond, and caused the bond to be forfeited.

After four years' delay and the sacrifice of thousands of dollars, the company succeeded in obtaining a rehabilitation of their charter, and in March, 1869, again commissioned their engineer to survey and locate the line from the Rio Grande to the Pacific. The engineer has surveyed two lines from the Rio Grande to Santa Cruz—one passing directly west from El Paso del Norte, and the other about north-west from Presidio del Porte to Jomos, Chihuahua, and from that place west to Santa Cruz.

Northern Mexico offers most superior advantages for a railroad route. Going west from the Rio Grande, the route, as surveyed, passes through fertile lands, surpassed by none in the world, crossing the low mountain ranges through most favorable passes and cañons. In all the mountains and spurs are inexhaustible supplies of the precious metals—such as would warrant the statement that in all extensive cuttings the material excavated would pay the cost of construction. From the Rio Grande to the Sierra Madre, about two hundred miles from El Passo, there is no really heavy work, and the line can be built and organised for about $20,000 per mile. In the passage of the Sierra Madre, at a point about fifty miles south of the Cañon Guadalupe, the cost will not exceed $70,000 per mile, and at that cost for about fifteen miles only. There are no heavy grades, only one that approaches to three per cent.; one short tunnel of excavation, through soft rock and auriferous quartz veins, and two bridges of short span. From the Sierra Madre to Santa Cruz the route lies through rich fertile valleys, and through mountains offering no obstruction to the most favorable grades. In the vicinity of the Sierra Madre, and thence to Santa Cruz, are immense quantities of wood—pine and oak—all within easy distance of the route, which will furnish in a great measure the materials used in the construction of bridges and ties.

From Santa Cruz, about two hundred and seventy miles, to Guaymas, the line as located passes through well watered valleys near flourishing towns, and traverses long "mesas" or table lands, making excellent roadbeds and grades not exceeding ten feet per mile. This section can be built and equipped for $13,000 per mile. In the port of Guaymas we find a commodious and safe harbor. A hundred-foot pier will take the road to three fathom water, where the largest steamers and ships can lie in any gale in perfect safety.

The line is intended to be a section of a "through line" from the Atlantic to the Pacific, connecting with the Memphis and El Paso Road at some point on the Rio Grande.

As a local railroad the line will pay, after the construction of the first mile of the road. It is difficult to convince any person not familiar with the interior of northern Mexico of the immense agricultural and mineral resources of the country, now but little developed on account of the lack of transportation, and the feeling of insecurity which pervades the entire country. The railroad once built, and giving as it will sure protection to all, especially foreigners, and furnishing the much needed transportation, immigration will take place in vast numbers; the old mines will be again opened, new ones discovered, and the vast tracts of the richest lands on the face of the globe will furnish thousands of tons of ores, and the products of the country for export to the different parts of the world.

The road has many advantages over other Pacific roads. In the first place, its cost of construction; in the second place, the ease and economy with which it can be kept in repair; and last, but not least, it will be a line which can run express trains every day throughout the year, in a climate not excelled on the continent.

Water Tuyeres of Hammered Copper for Blast Furnaces.

UPPER SILESIA, which has already contributed so much to the progress of the iron industry, again furnishes us with a novelty in the form of a new tuyère. It is well known that, owing to the superior power of copper for conducting heat, many experiments have been made to use tuyères of this metal, in place of the iron ones in general use; but they have always been cast, and therefore liable to many imperfections which are avoided by the use of rolled and hammered copper. They have now been in use for over a year, and have given, as we are informed, very satisfactory results. Two truncated cones are, in the first place, made of the very best metal, each being hammered out of a single piece of half-inch copper. The one is three and a half inches larger in diameter, at corresponding points, than the other, and from three and a half to five inches longer. The end of the larger cone is then bent over and inwards, from two and a half to three and a half inches, so as to fit exactly to the smaller end of the other cone and form a continuation of it. The two edges are then firmly soldered together, and the tuyère is tested up to twelve atmospheres pressure. A great advantage of this mode of construction is, that only the very toughest and best copper can possibly be worked in this way, and if there are any imperfections, they are exposed in the process of hammering, and the piece is accordingly to be rejected. These tuyères are made eighteen inches long, with an aperture of three and a half inches at the smaller, and eight inches at the larger end. The water circulates freely between the two cones. Experience has shown that these tuyères last at least four times as long as the cast tuyères now in use. The latter weighed about one hundred and ten pounds, and cost on an average fifty-five thalers (about forty dollars) apiece; whereas, those made in the way described weigh only from fifty to sixty pounds, and cost only thirty-five thalers (about twenty-six dollars) each. There is a saving of sixty per cent. in the cost of material, and an increase of about sixty per cent. in the cost of labor in the new tuyères. The great saving arising from the fact that they last so much longer, is placed as high as eighty per cent. by those who have used both.

New Uses for Bisulphide of Carbon.

THE application of bisulphide of carbon, according to SIDOT, renders wood very sonorous, and makes it an excellent conductor of heat and electricity. SIDOT passed vapors of bisulphide of carbon over pieces of wood in a porcelain tube, first in the cold, in order to expel the air, and then at high temperature, the tube being slowly and gradually heated for an hour, until it was red hot. The various kinds of wood yield by this treatment a coal which is not surpassed by the most sonorous substances known. SIDOT made a bell of oak wood, and subjected it to this treatment with bisulphide of carbon. The sound it gave after the process compared favorably with that of a metallic bell of equal diameter. The hardest kinds of wood seem to produce the purest and most harmonious tones. On account of its capacity of conducting heat and electricity, SIDOT recommends the coal prepared in this manner for use in BUNSEN'S galvanic batteries, and for pencils of electric lights. Such pencils give a much intenser light than those made from the graphite of gas retorts; they become gradually white hot throughout their whole mass, without burning at a single point, and cool down immediately as soon as the fire is removed. Linen, hemp, cotton, paper and silk behave similarly to wood, and the action of methylated spirits, (wood naptha) hydrocarbons, etc., resembles that of bisulphide of carbon. The coal from wood has superficial metallic lustre, is denser than common charcoal, and has a greater absorbing power for gases. —*Comptes Rendus.*

MINING COMPANIES AND STOCK QUOTATIONS.

GOLD AND SILVER COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
Alameda Silver		A. Queran, 108 Wall st.	$2,000,000	$10 00		
Ada Elmore	South Boise, Idaho					
American Flag	Nevada District, Col.	P. P. Fullerton, 71 B'way	600,000	10 00		
Atlantic and Pacific	Humboldt Co., Nevada.					
Bates and Baxter	Colorado			50 00		
Benton	Colorado	W. F. Drake, 15 Broad	500,000	5 00		10
Briggs	Colorado	J. P. Davies, 19 Cliff	1,000,000	100 00		
Black Hawk	Colorado	C.T.Whittington, 48 Broad	2,500,000	100 00	30	50
Bobtail	Colorado	J. Stanton, Jr., 25 Nassau	1,000,000			
Bullion Consolid'ed Gold	Colorado					
Burroughs Gold	Colorado					
Central Gold					19	23
Consolidated Gregory	Colorado				1 66	1 75
Combination Silver	Nevada			100 00	50	
Columbia Silver	Austin, Nevada	J. M. Brown, 155 B'way	5,000,000			
Commercial Silver		J. E. Smith, 26 Pine	3,000,000			
Corydon	Gilpin Co., Colorado	J. Samuels, 40 B'way	500,000			
Downieville	Colorado		2,500,000	25 00		
Eagle Gold	Gold Dirt Dist., Col.	J. P. Davies, 19 Cliff	300,000	1 00		
Empire Gold and Silver	BodieBluff,MonoCo.Cal	H. K. Gates, 70 B'way	1,000,000			
Edgehill		A. Fullerton, 71 B'way	10,000,000			
Esperanza Silver		Ezra Clark, Jr., 13 William	400,000			
Fisk Gold		H. Johnson, 195 Fulton	500,000			
Forest Queen		E. B. Bect, 62 B'way	1,000,000			
Golconda Gold	Sherbrooke, C. E.	H. Adams, 71 Broadway	2,000,000			
Gunnell Gold	Colorado	J. H. Rolston, 80 B'way	1,000,000	50 00		
Gunnell Central	Colorado	C. B. Bostwick, 16 B'way	3,000,000	10 00		
Gold Rock		R. M. Lockwood, 93 Wall	400,000			
Grass Valley						22
International Silver		J. W. Brazier, 26 Pine	600,000			
Hope Gold	Colorado		5,000,000			
Holman			2,000,000	25 00		
Kipp & Buell	Colorado		300,000			
Knickerbocker Gold		J. H. Rolston, 80 B'way	200,000	100 00		
La Crosse Gold	Nevada Dist., Col.	P. P. Fullerton, 71 B'way	1,000,000		9	12
Lander Hill T. & S.	Nevada	M.L.Catherwood,74 B'way	1,000,000			
Lewis Gold	Georgia		1,000,000			
Liberty Gold					01	02
Manhattan Silver	Nevada	M. L. Ogden	400,000			
Maraposa common	California	Jas. H. Ferdon, 34 Wall	12,000,000		7½	8½
Mariposa preferred	California	do. do.			17½	17½
Montana Gold		G. De Cordova	400,000			
Montana M. L. & M. Co.	Montana	A. M. Hoyt, 22 William	250,000			
Montrose	Clear Creek Co., Cal.	W. W. Perkins, 71 B'way	1,000,000			
New York Silver	Nevada	Thos. Sproull, 78 B'way	1,500,000			
New York and Austin	Nevada	E. R. Siccomb, 70 Wall	500,000			
New York and Owyhee	Owyhee Co., Idaho		1,000,000			
New York and Eldorado		G. H. Munroe, 10 Wall	2,000,000			
N. Y. & Montana M. & D.	Montana	F. A. Chapman, 20 Nassau	1,250,000			
N. Y. & Silver Peach	Nevada	R. C. Root, 74 B'way	2,000,000			
N. Y. & Utah P. & M.		W. H. Mailler, 108 Wall				
Nye						
Ophir Gold	Comstock Lode, Nev.	L. C. Warner, 70 B'way	625,000			21
Owyhee Gold		W. H. Smith, 43 Ex. Place	1,500,000			
Pahranagat Central	Nevada	J. E. Smith, 25 Pine	6,000,000			
Quartz Hill Gold		F. Bernard	2,500,000		25	26
Reese River Consol'd	Nevada	W. B. Ogden	6,000,000			
Rocky Mountain	Colorado	S. M. Pond, 70 B'way	500,000	10 00		
Rollins Gold		Thos. Bond, 132 B'way	600,000			
Sensenderfer	Colorado	H. A. Shewill, 19 Broad	1,000,000		1 60	
Silver Bend		F. W. Macy, 20 Nassau	1,500,000			
Silver Mt. Silver		H. A. Moen, 71 B'way	1,000,000			
Silver Peak & R. M.	Nevada	W. B. Ogden, 52 Wall	5,000,000			
Smith & Parmelee	Colorado	W. H. Hollister, 6 Broad	2,500,000	20 00	1 25	1 40
Social & Steptoe Con.		T. H. O'Connor, 24 Nassau	450,000			
Standard Gold		C. B. Bostwick, 169 B'way	500,000			
Symonds Forks						75
Twin River Silver	Nevada	J. F. R. Hadden, 20 Nassau	800,000	100 00		
Texas Gold	Colorado		500,000	10 00		
Union Gold	Colorado	F. A. Potts, 110 B'way	1,200,000			
Wash. Mill & Silver	Nevada	W. W. Perkins, 71 B'way	300,000			
Wauba Yuma	Arizona	J. W. Silsby, 36 Pine	6,000,000			

COAL AND IRON COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
American Coal Co.		M. A. Myers, 119 B'way	$1,500,000	$25 00		
Ashburton Coal Co.		J. T. Rollins, 41 Pine	2,500,000			
Block House Coal		D. B. Keeler, Jr., 43 Pine	1,000,000			
Brewster Iron		H. Robison, 165 B'way	150,000			
Broad Top Coal & Iron Co	Pennsylvania	B. Love	2,000,000			
Cameron Coal Co.		J. A. Simpson, 40 B'way	2,500,000			
Carbon Hill Coal Co.		J. Silsby, 36 Pine	1,000,000			
Central Coal		F. P. White, 111 B'way	2,000,000	100 00		
Clifton Iron Co.		P. H. Riordan, 34 Pine	1,250,000			
Columbia Iron		E. D. Webb, 77 Cedar	1,000,000			
Consolidation Coal	Maryland	J. S. Mackie, 71 B'way	5,000,000			
Crawford Coal		E. Clapp, Prest, 137 B'way	1,000,000			
Cumberland C. & I. Co.		E. Kisean, 90 B'way	5,000,000			45
Derby Coal Co.		W. S. Davison, 11 Broad				
Dover Coal and Iron Co.		L. Chase, 88 Wall				
Del. & Hudson Canal Co.		R. H. Nodyne, 7 Nassau	15,000,000	100 00	100	
Ebervale Coal		G.L Stout, Treas., 111 Br'y	500,000			
Fall River Bituminous		D. T. Blauvelt, 43 Pine	1,000,000			
Farrar Coal		C. H. Jones, 43 Pine	250,000			
Fisher Iron Co.		M. Ellis, 19 William	100,000			
Hamp're & Balt. Coal		S. M. Pond, 70 B'way	500,000			
Iron Cliffs Co.		C. J. Canda, 52 Wall	1,000,000			
Jackson Iron		G. P. Loyd, 119 B'way	300,000			
Kemble Coal & I. Co.		R. A. Wight, 26 Ex. Place	300,000			
Keokuk Coal		J. F. Franklin, 112 B'way	100,000			
Lackawanna I. & C.	Pennsylvania	E. C. Lynde, 52 Wall	1,200,000			
Lewis Run C. & I. Co		C. A. Sanborn, 80 B'way	750,000			
Lykens Val. Coal Co.		F. A. Platt, 13 William	800,000			
McKean Co. Bit. Coal Co.		J. H. Rolston, 80 B'way	1,500,000			
Lehigh & Susquehanna		E. W. Cark, Philadelphia, Pa.			1 80	
Mahanoy			400,000	100 00		
McNeal C. & I. Co.		C. C. Godwin, 71 B'way	500,000			
Mount Riga Iron		G. M. Newton, 42 Cedar	300,000			
New Boston Coal		C. H. Ogden, 55 B'way	2,000,000			
N. Y. Con. C. & I. Co.		A. T. Levine, 16 Wall				
N. Y. & Lehigh Coal		T. Simpson, 111 B'way	150,000			
Pacific Coal Co.		G. Wrighton, 34 Wall				
Peekskill Iron Co.		W. Murdock, 7 Nassau				
Pennsylvania Coal Co.		E. H. Mead, 111 B'way	3,200,000	50 00		
Richmond Iron Co.		C. H. Smith, 165 B'way	1,000,000			
Scotia Coal Co.		[illegible] Soper, 42 B'way	2,500,000			
Spring Mt. Coal		[illegible] Runyon, 111 B'way	1,250,000			
Springfield & D'p Run C.		E. D. Webb, 77 Cedar	600,000			
Stout Coal Co.		G. S. Comstock, 111 B'way	500,000			
Susquehanna & Wyoming		E. Potter, 40 B'way	1,000,000			
Tannerdale Coal		I. T. Ludlaw, 71 B'way	250,000			
Wash. Mutual Coal		M. C. Baker, 117 B'way	420,000			
West Point Iron Co.		R. C. Brock, 110 B'way	500,000			
Wilkesbarre C. & I. Co		W. H. Tillinghast, 80 Br'y	3,400,000			
Wyoming Val. Coal Co.		E. Potter, 40 B'way	1,000,000			

COPPER AND LEAD COMPANIES.	SITUATION OF MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED
Anita Copper	California	J. A. Ferguson, 8 Wall				
Corinth Copper	Corinth, Vermont	S. H. Howard, 191 B'way	$500,000	25 00		
Davidson Copper						
Eagle Harbor Copper	Michigan	W. H. Smith, 43 Ex. Place	500,000	25 00		
Evergreen Bluff Copper	Michigan	F. W. Caper, 44 Ex. Place	500,000	25 00		
Globe Copper		R. K. Rickard, 19 Nassau	200,000			
Grand Portage Copper Co		A. S. Kellogg, 22 Pine	500,000			
Guymard Lead		Samuel Vernor, 38 Pine				
Hilton Copper		W. H. Smith, 43 Ex. Place	500,000			
Hope Copper		J. W. Davis, 19 Nassau	500,000			
Hudson River Copper	New York	T. Clarkson, 22 William	1,500,000			
Indiana Copper Co.		J. M. Mills, 25 Nassau	500,000			
Isle Royale Copper	Michigan	F. W. Caper, 44 Ex. Place	1,000,000			
Keweenaw Copper	Michigan	F. W. Caper, 44 Ex. Place	500,000			
Lake Superi'r Silver Lead	Michigan	A. S. Kellogg, 22 Pine	1,000,000			
Omiga Copper	Michigan	S. Cooper, 7 Pine	500,000			
Ridge Copper	Michigan	J. L. Gardiner, Jr., 43 Ex. P.	500,000			
Rockland Copper	Michigan	A. Fullerton, 71 B'way	500,000			
St. Joseph Lead	Michigan	J. W. Jones, 6 Broad st,	1,000 000			
St. Marguret Copper		E. P. Sutton, 43 Pine	250,000			
Schoolcraft Copper		R. Walsh, 22 William	500,000			
Superior Copper	Michigan	A. Fullerton, 71 B'way	500,000			
Union Copper		A. S. Kellogg, 22 Pine	500,000			
Vermont Copper	Vermont	J. C. Ely, 191 B'way	500,000			10
Wallkill Lead, asst		S. M. Pond, 70 B'way				

MISCELLANEOUS.	SITUATION MINE.	SECRETARY AND PLACE OF BUSINESS.	CAPITAL.	PAR VALUE.	OFF'R'D.	ASKED.
American Zinc Co.		W. E. Lawton, 19 Cliff	$1,000,000			
Bigelow Blue Stone Co.		H. Bogardus, 14 Pine				
Quicksilver						
Covill B. L. M. & M'f. Co		C. R. Bostwick, 302 Pearl	250,000			
Manhattan Marble		H. K. Gates, 70 B'way	300,000			
N. Jersey Zinc Co.	New Jersey	A. H. Farlin, 61 Maiden L'e,	1,500,000			

Blast Furnaces.

FROM a return recently published in RYLAND'S *Iron Trade Circular*, of the blast furnaces in the various iron-making districts of the United Kingdom, we abstract the following particulars:

Name of District.	Number of Blast Furnaces. In blast.	Out of blast.	Total.
South Staffordshire	102	72	174
North Staffordshire	27	10	37
Shropshire	21	8	29
West Coast	34	9	43
South Wales	111	87	198
Cleveland (about)	101	14	115
Scotch	129	29	158
	525	229	754

Besides the furnaces above mentioned, there are in the Cleveland district eleven new furnaces now building, while several of the Cleveland firms are rebuilding and raising old furnaces. Two new furnaces are also in course of erection in the West Coast district.

MISCELLANEOUS.

83D AUCTION SALE.

80,000

TONS SCRANTON COAL,

ON WEDNESDAY, MAY 25, 1870.

NEW YORK, May 18, 1870.

The DELAWARE, LACKAWANNA & WESTERN RAILROAD COMPANY will sell, by Messrs. JOHN H. DRAPER & CO., Auctioneers, at the Company's Salesroom, 26 Exchange Place, corner of William street, New York, on WEDNESDAY, MAY 25, at 12 o'clock, noon,

80,000 Tons

of Coal, from the Lackawanna Regions, of the usual sizes, deliverable at their Depot, Elizabethport, N. J., during the month of June, 1870.

The sale will be positive; each lot put up will be sold to the highest bidder; no bids, in any form whatever, being made for account of, or on behalf of the Company. The conditions will be fully made known at the time of sale.

TERMS: Fifty cents per ton, payable in current funds on the day of sale, and the balance, within ten days thereafter, if required, at the Office of the Company.

SAMUEL SLOAN, President.

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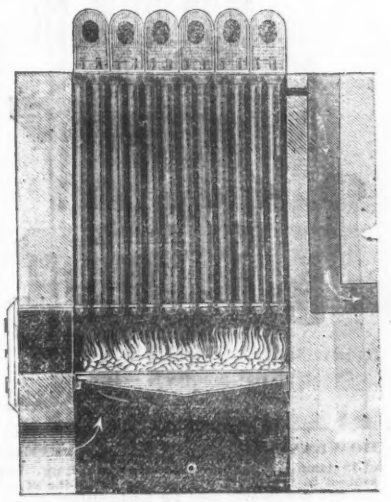

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Of any power required, upon two weeks' notice. They have been introduced in this city and thoroughly tested, with most satisfactory results, and are sold under Guarantee of Absolute

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They are cheaper in first cost and in expense of erection, more economical in fuel, durable and convenient in use, than any other apparatus for generating steam. For Mining purposes it is unequalled, owing to the facility with which it can be transported and erected.

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MISCELLANEOUS.

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May 17:1y

NOVA SCOTIA.

GOLD MINE FOR SALE.

The Subscriber will sell at Public Auction, at the Merchants' Exchange Reading Room, in the City of Halifax, on WEDNESDAY, the 1st day of June next, at 12 o'clock:

The Gold Mine and Plant in the District of Lawrencetown, lately owned by Glasson and Strange, consisting of—

1st. One hundred and twenty-nine first-class areas, numbered as follows, viz: from 51 to 61; from 140 to 161; 243 to 258; 343 to 359; 438 to 463; and 538 to 550, all inclusive, in the original block; and from 395 to 406, 495 to 506, all inclusive, in block No. 5. Many veins have been discovered on this property, all gold-bearing, but only two tested. One of these is a continuation of the vein discovered on the opposite side of the lake by Messrs. Waddelow, from which the present proprietor, James Carson, Esq., of New York City, has taken perhaps the richest rock that has been found in the district. It has been sunk on about 15 feet, a few tons of quartz raised, and a test gave 16 dwts. ($16) to the ton. The other vein tested is fed by twelve tributary veins, and two shafts sunk on it, one about 45 and the other about 112 feet deep. In the first gold was struck at 35, and in the second at 55 feet deep. A test at the Montague mills gave a few grains over one ounce to the ton, and the last rock taken from each shaft was the best. In parts this vein is very thick, at the thickest only the width of the shaft (5 feet) being taken out. There are other feeders or tributary veins that will come into it at a still greater depth, one of them, 5 feet thick, will come into the seam at 180 feet depth.

2nd. Lease of Water Power for 21 years, with privilege of renewal. This furnishes a good power within 100 feet of the main shaft.

3rd. Mining Plant, consisting of Shaft House, Blacksmith Shops and tools, Frame for Flume, and Building for Driving Machinery, Mining Tools, &c.

4th. Quartz raised on the ground, estimated at about 500 tons. A good route for a road from the mine to the public highway has been surveyed and laid out by order of the Government.

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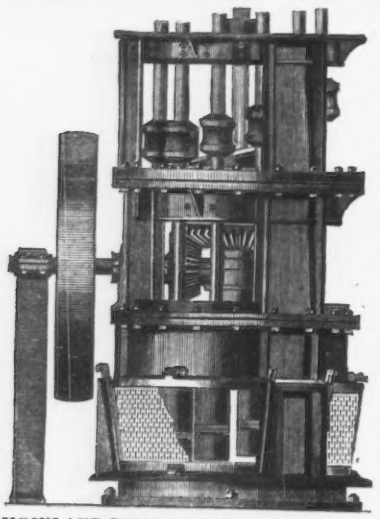

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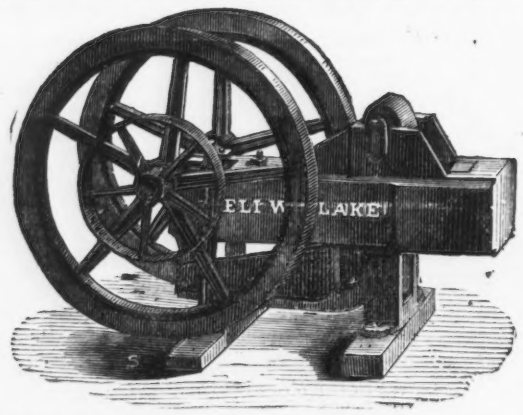

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This machine has now been in use, enduring the severest tests, for the last ten years, during which time it has been introduced into almost every country on the globe, and is everywhere received with great and increasing favor as a labor-saving machine of the first order.

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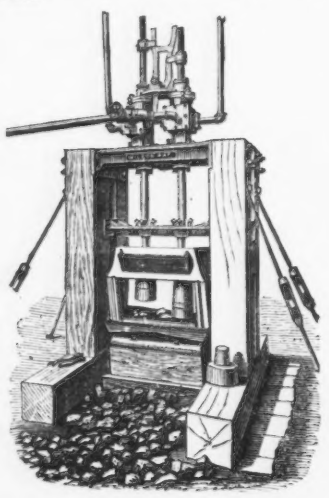

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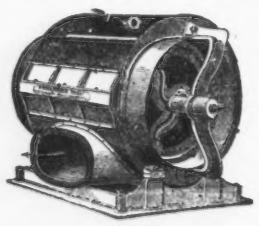

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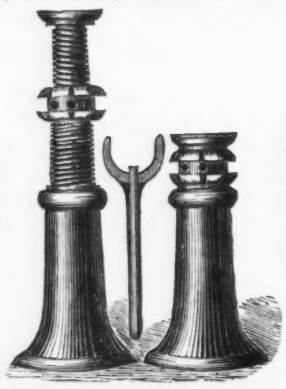

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The *MECHANICAL COMBINATIONS* are extremely simple, the machines therefore correspondingly durable. A continuous self-delivery of ore on one side and tailings on the other is effected, hence very little attention is required except keeping the hopper supplied with ore. The power of one man is sufficient to operate a machine that will concentrate one ton per hour.

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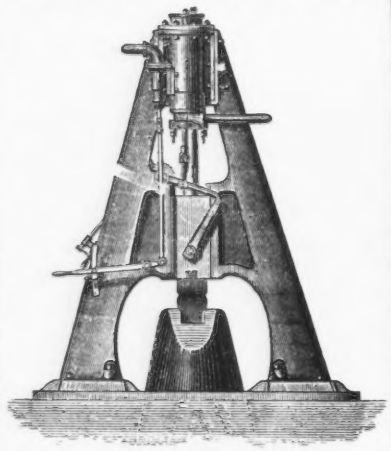

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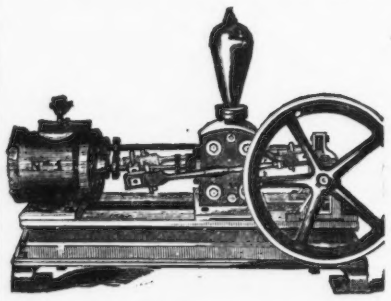

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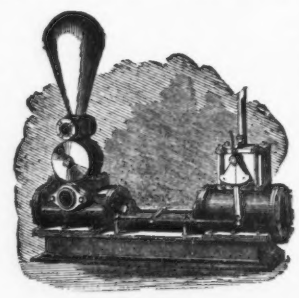

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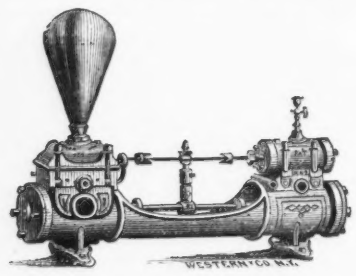

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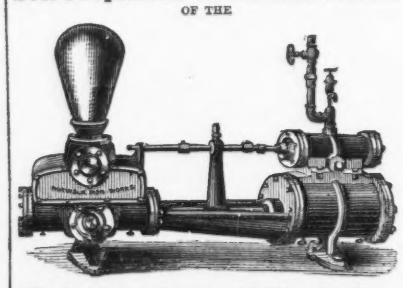

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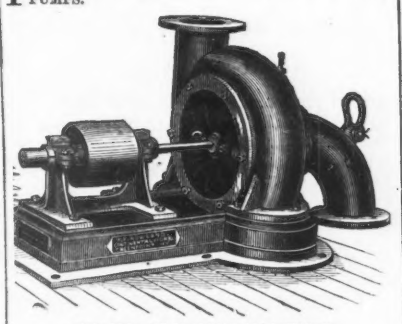

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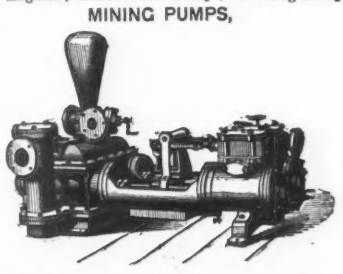

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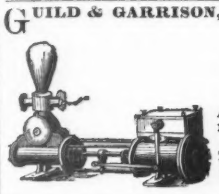

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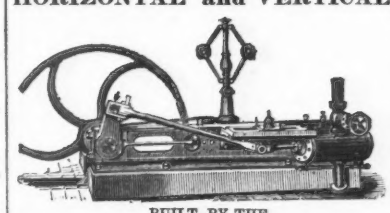

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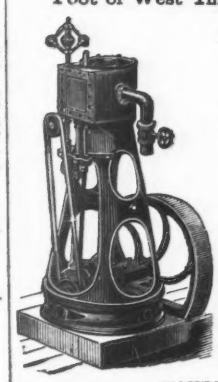

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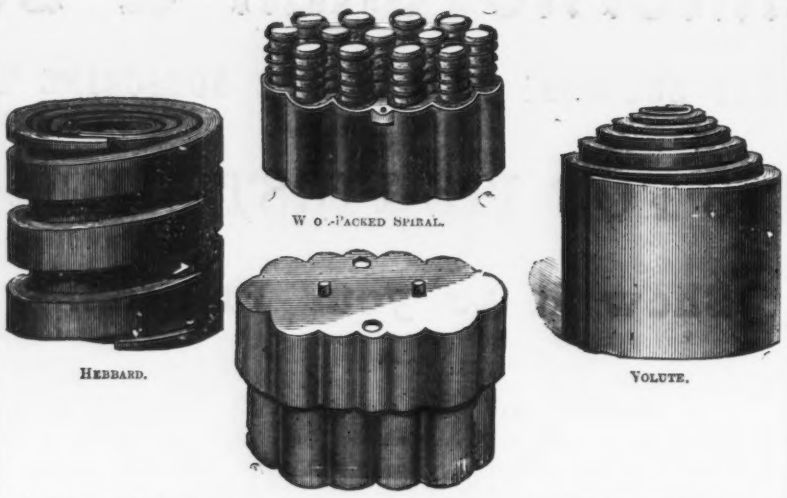

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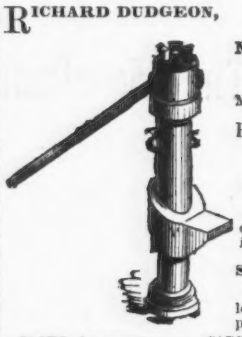

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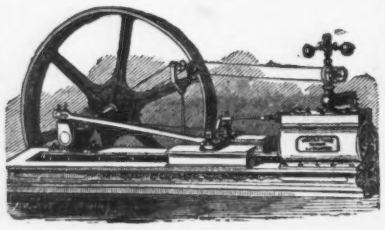

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